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ROCKY MOUNTAIN SHEEP
From a painting by Carl Rungius

THE ONE VOLUME

NATURE ENCYCLOPEDIA

EDITED BY

G. CLYDE FISHER, PH.D., LL.D.

Prepared under the auspices of
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FOREWORD

To understana nature is to gain one of the greatest resources of life.—JOHN BURROUGHS.

THE better one understands nature, the better he understands himself, for we see our lives reflected in the lives of the plants and animals about us, and this helps us to crystallize the philosophy of life which we as thinking persons frame or adopt for ourselves.

No one who is interested in nature is ever bored by having nothing to do. No naturalist ever has to kill time. He always has a wholesome interest and a profitable activity to engross his energies and occupy his time. No matter where he is, whether in city or country, whether it be a bumble-bee visiting a roadside flower or a mud-dauber wasp provisioning its nest with spiders, or the common House Sparrow picking up its living in our crowded cities,—there is always something at hand to absorb his attention.

In anyone's dooryard there is more than he can master in a lifetime.

Everyone will welcome such helps as these contained in "Nature's Secrets," each section of which has been written by a specialist in that particular field. And one of the most helpful features of these books is the numerous illustrations. Oftentimes a good photograph or drawing is clearer and accomplishes its purpose better than pages of printed text. John Burroughs said that the thing which had most to do with making him a naturalist was his finding Audubon's bird books in the library of the West Point Military

Academy, when he was teaching school in that vicinity. These fascinating bird-biographies, together with the wonderful drawings which Audubon had made in the woods, impressed the budding naturalist profoundly. It was, he said, like bringing powder and fire together.

In his first nature book, which was almost entirely about birds, Burroughs says that he who takes the first step in ornithology is ticketed for the whole voyage. There is an important truth here.

The pursuit of the fur-bearing animals, the mammals, in our observations, appeals to one's primitive love of the chase and to his love of exploring; in other words, to his hunter-naturalist instincts. Many people to-day have learned that it is just as much fun to hunt the mammals with a camera as with a gun, and have therefore given up the latter. In fact, it usually requires far more wit and patience to make a good photograph of a wild animal in its natural habitat than it does to shoot the animal with a rifle. Hence, successful photographers of wild animals in the field and woods are usually better sportsmen than they who hunt with the gun, and certainly they have as much fun. In view of the terrible slaughter of game that has taken place in this country during the past years, it is plain that we had all better turn camera-hunters or hunters with the note-book rather than with trap or gun, if we would conserve the animal life for future generations to enjoy.

The study of birds appeals to us in the same ways, with the addition that they have a stronger hold from the esthetic side. We enjoy the beauty of their plumage and the beauty of their songs. From the practical side we shall be interested to investigate the economic value of birds,—

how the Bob-white and others aid the farmer in his continual fight against noxious weeds by eating the weed-seeds, how the Long-eared Owl and his relatives are of great value to the farmer and orchardist by feeding upon mice and other destructive rodents, how the Turkey Vulture and other birds are extremely valuable as scavengers, and how the Baltimore Oriole and a great many other species of birds feed largely upon destructive insects. The birds continue another great field for the photographer of wild life.

In like manner we could review some of the interests of the reptiles,—how most snakes are valuable friends of the farmer, how the snake captures and swallows its prey. Everyone will be interested in dispelling some of the many superstitions about snakes and other reptiles.

The frogs, toads, and salamanders hold our interest, not only because of their habits, but also because of their wonderful development which can be so easily observed.

Nearly everyone likes to go fishing, and so the study of the habits of the fishes is a part of the game.

The lower animals form a vast and attractive assemblage. There are more kinds of insects in the world than there are of all other animals put together. This fact, however, should not appall us. While we cannot hope to know them all, we can easily become acquainted with a few, and no animals have more wonderful instincts or inherited habits than the ants, bees, and wasps. When you see the hornet building its nest, remember that it "was the first paper-maker and holds the original patent."

Man and all the other animals are absolutely dependent upon the plants of the world, and the trees and other plants are living things with life-histories as remarkable as those of the animals. In the sections on Wild Flowers, on Ferns, and on Trees, you will find out many things you want to know about these members of the vegetable world.

When a plant or an animal attracts our attention, the first thing we want to know is its name,—so this book has been planned to help us in identifying the trees, the birds, etc., but they have not been prepared to give encouragement to the idea that the name of a plant or animal is the end of our pursuit. On the other hand, it is to be hoped that the name will serve only as an introduction to the life-history and behavior of the plant or animal.

G. Clyde Fisher

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KNOWING THE BIRDS

The bird is little more than a drift of the air brought into form by plumes; the air is in all its quills, it breathes through its whole frame and flesh, and glows with air in its flying, like a blown flame; it rests upon the air, subdues it, surpasses it, outraces it—is the air, conscious of itself, conquering itself, ruling itself.

Also, into the throat of the bird is given the voice of the air. All that in the wind itself is weak, useless in sweetness, is knit together in its song. As we may imagine the wild form of the cloud closed into the perfect form of the bird's wings, so the wild voice of the cloud into its ordered and commanded voice; unwearied, rippling through the clear heaven in its gladness, interpreting all intense passion through the soft spring nights, bursting into acclaim and rapture of choir at daybreak, or lisping and twittering among the boughs and hedges through heat of the day, like little winds that only make the cowslip bells shake, and ruffle the petals of the wild rose.

Also, upon the plumes of the bird are put the colors of the air; on these the gold of the cloud, that cannot be gathered by any covetousness; the rubies of the clouds, the vermilion of the cloud-bar, and the flame of the cloud-crest, and the snow of the cloud, and its shadow, and the melted blue of the deep wells of the sky——all these, seized by the creating spirit, and woven into films and threads of plume; with wave on wave following and fading along breast, and throat, and opened wings, infinite as the dividing of the foam and the sifting of the sea sand,—even the white down of the cloud seeming to flutter up between the stronger plumes, seen, but too soft for touch.—JOHN RUSKIN.

OUTDOOR BIRD STUDY

By EDWARD HOWE FORBUSH

THE beginning of interest in bird study is gradual in some cases. In others, especially in the young, it is almost instantly awakened by the unexpected sight of some beautiful bird, or even by a book with colored plates.

All beginners have before them in this study a source of unimagined enjoyment, wonder, and delight. Bradford Torrey, whose interest in birds came with mature years, once said that when a man began to be ornithologically inclined, it was very much as if all the birds had just been created, or at least as if they had just been let out of the Ark. "Like the Lord's mercies," he said, "they were new every morning and fresh every evening." John Burroughs asserts that "if you take the first step in ornithology you are ticketed for the whole voyage." This is true of enthusiastic and industrious beginners, some of whom may become ornithologists in the fullness of time, but these hints for outdoor bird study were not written for experienced ornithologists, who do not need them, but for such fathers and sons who, having taken the first step, find pleasurable recreation in spending a part of their leisure time in the observation and study of living birds in the field. The first step in this study is to learn how, when, and where to find birds.

How to Find Birds

There are birds everywhere, but not always. In winter there are practically no birds above the timber line on high mountain peaks or near the north pole. Dr. Donald B. MacMillan, the Arctic explorer, tells me that the Raven is almost the only bird that commonly winters at Etah, the northernmost Eskimo settlement in Greenland. During periods of migration, and in the depth of winter, there are always times and places in the temperate zone where there are few, if any, birds. In the breeding season birds may be found, even in the desert, but they prefer some localities to others, and are most numerous in those that suit them best.

Where to Look

The bird student soon finds that some localities are better supplied with bird life than others. Many species, while migrating, follow or visit such coasts or river valleys as lie along or across their natural lines of migration. City dwellers may find many birds in city parks during migrations. Apparently there is something about the lights of a large city, especially on misty nights, that attracts birds when migrating. If a city park with trees, shrubbery, and water be visited early each morning in spring and autumn many species may be noted. Birds there, being protected and seeing people continually, are unsuspicious, and may be readily approached. Mr. Horace W. Wright records 120 species in the Boston Public Garden, and Dr. and Mrs. E. W. Vietor have noted 162 species in Prospect Park, Brooklyn, New York. Water birds may be found usually in spring and fall in the ponds of large park systems. In such places these birds, being less shy than elsewhere, may be watched and studied.

Birds require food, water, shelter, nesting places, and protection from their enemies. In localities furnishing all these essentials birds always may be found in their seasons. Water always attracts birds. Therefore the bird watcher seeks the neighborhood of lakes or streams. A broad river valley, with fresh-water meadows, containing small, marshy ponds if dotted with trees and bordered by farming lands, orchards, and wooded hills, should be an ideal place for birds.

When migrating they appear to stop by preference where there is an abundance of suitable food with which they may replenish the waste of tissues worn by flight. At such times birds that have found food attract by their calls others flying by or overhead; these also are heard or seen by others still, and so they come from far and near. To find a good place for migrating warblers in fall or spring, look for plant lice on the birches in some sheltered locality,—an old neglected pasture overgrown by young birches is an excellent place. Where these insects are numerous it is impossible to pass among the trees without collecting numbers of the little green creatures upon your clothing. Often I have found many migrating warblers in such places, when elsewhere in the woods there were very few to be seen. Sparrows, blackbirds, orioles and other birds of the orchards, swamps, and fields are attracted to the woods by these plant lice.

In early spring you may watch the birds when they are feeding on the tiny young tent caterpillars or other leaf-eating larvæ. Both species of Cuckoo, the Vireos, Orioles, Chipping Sparrows, Goldfinches, and several Warblers come to the caterpillars' webs either to get food or to procure web to use in the construction of their nests. In May and June an old neglected orchard is a good hunting ground. The apple-tree has countless insect enemies, and birds seek them in a neglected orchard where the trees are neither scraped, pruned nor sprayed. To see the birds that come to the orchard, one should find a few trees attacked by cankerworms or other inch-worms, then sit down quietly, and watch the birds that come to feed on them. In this way one may see, in an hour or two, nearly all the birds of a locality, for most birds feed on these insects and carry them to their young. In July and August birds may be found in swamps where berries grow. They fly to the wild cherry trees in August and September. Wherever we go we shall find some birds, but if one is in search of a particular species, he may not find it unless he knows where to look.

Birds are much influenced by the character of their food in choosing their nesting sites. Our northern Yellow-Throat commonly prefers to live near the low, wet border of some running stream, while the Chestnut-sided Warbler is quite as likely to be found anywhere in sprout land, shrubbery, or by the roadside. The Pine Warbler prefers pitch pines, but the Black-Throated Green Warbler is found more among white pines, where the Crows and Jays breed. The Prairie Warbler usually is seen on hot or dry, sandy or gravelly lands, among low shrubbery or scattering trees. The Redstart seems to like a coppice along a brook, while the Oven-Bird may be found quite generally distributed among deciduous woods. Scarlet Tanagers feed largely on insects infesting white oaks, and, together with Rose-Breasted Grosbeaks, usually may be found in or near large white oaks, but the Grosbeaks are not at all confined to the oaks, and usually breed along running streams, in localities frequented by Redstarts. Both Tanagers and Grosbeaks often are common in mixed oak and chestnut woods.

Different species of Sparrows also seek diverse localities. The Indigo Buntings live much among the new sprout growths, where woods recently have been cut off, or in bushy hillside pastures. In the fall they go often to cornfields and gardens. The Towhees, or Chewinks, usually inhabit, with the Thrashers, a slightly larger growth. Grasshopper Sparrows, Vesper Sparrows and Field Sparrows are largely birds of the open upland fields and pastures, while Henslow's Sparrow seeks small patches of low, wet grassland, or large meadows. The Song Sparrow nests along the shores of rivers and ponds, near swamps or springs, or on the banks of brooks or ditches, while the Swamp Sparrow seems to prefer bushy swamps bordering on rivers or ponds, and is seen often near the haunts of Bitterns, Herons, and Rails, which frequent marshes, meadows, and low grassy shores.

When to Look

Early mornings and late afternoons are the best times for observation, partly because most birds are then active and vociferous, and partly because there often is little wind movement then. The least motion of a bird is noticed when the branches and leaves are still, but when the wind blows, birds are more likely to be overlooked; also they are wilder on windy days, when they can spread their wings and be borne away with little effort. Cool days, with strong northwest winds, are unfavorable for bird study. Warm, still days are best. Small land birds usually seek shelter during heavy rains, but are active during light, warm showers.

The Spring Migration

Beginners in bird study usually choose the spring as the best time for making the acquaintance of the birds; but it is well to begin early in the year, when birds are few, and learn to recognize each species as it comes. Gulls, Wild Ducks, and Geese begin to go up the rivers in March as soon as the ice breaks up, and Mergansers seek open places on the lakes. In March and early April we may find birds on warm days or in sheltered places.

A partly wooded river valley will attract birds in April, when the nights and many of the days are cold. Insects fly on warm days very early in April, in the sunny reaches of such a river. In such spots the Rusty Blackbird appears. Pine Warblers, Yellow Palm Warblers, and Ruby-crowned Kinglets may be found near the water catching flying insects after the manner of Fly-catchers. On such rivers Herons and Bitterns sometimes may be seen very early. The early Sparrows feed in April on the sheltered sides of wooded hills, in bushy lands, or on sunny slopes of adjoining fields or pastures. In cold, windy weather birds always prefer the sheltered spots where there is food. By bearing this in mind you may find Flickers, Meadowlarks, Fox Sparrows, Grackles, Blackbirds, Cowbirds, Robins, and Bluebirds in March.

It is well to remember that the old males usually come first, and the females and young birds later.

The Nesting Time

The species of birds to be found in the nesting season at a given place depend largely on the temperature of the locality. "The southward distribution," says Dr. C. Hart Merriam, "is governed by the mean temperature of a brief period during the hottest part of the year." The temperature at this time depends largely on four factors—the latitude, the altitude, the amount of moisture, and the character of the forests. Latitude and altitude have the same effect. Other conditions being equal, the mean temperature lowers as we go higher up or farther north. Dr. Merriam has been able, after long study and as the result of many exploring expeditions, to divide North America into boreal, austral, and tropical "regions." Then he has divided these regions into life zones—the boreal into the Arctic, Hudsonian, and Canadian zones, and the austral into the transition, upper austral, and lower austral zones. The zones of the austral region are again divided. The eastern sub-division of the transition zone is called the Alleghanian faunal area, and the eastern division of the upper austral zone, the Carolinian faunal area. These terms are now generally employed in discussing the distribution of birds. Each region, zone, and area has animals and plants which are peculiar to it, or which thrive best within its limits.

Changes caused by woodcutting and farming bring about changes in the bird life of a region. The draining of a great swamp may drive out species that previously bred there, and their places may then be taken by others. The draining of a marsh or the cutting of a large tract of timber may have a similar effect. The cutting away of the spruce forest may drive out some Canadian Warblers, and at the same time may bring in White-throated Sparrows and Towhees, which breed in the "slash" and sprout growth. The foregoing considerations may indicate that while a study of the faunal areas and breeding zones is useful to determine where certain species may be nesting, nevertheless breeding birds may be sought and sometimes found quite outside of the areas where one would expect to find them. Therefore every locality should be searched during the nesting season.

July is one of the most interesting months in the bird calendar, for then there are many young birds about, and some of the birds which have reared their young begin to slip away toward the south, and shore birds begin to come from the north.

The Autumnal Migration

In August many land birds are inactive, shy, and retiring because of their molt. Many others are then leaving for the south, and many which breed to the northward have not yet reached us, but shore birds and a few ducks are then migrating southward, and some shore birds are visiting the shoal spots of lakes and rivers, where the water is low. These birds may be studied to advantage in August and early September. In August, September, and through October, Warblers, Thrushes, Sparrows and other small land birds arrive from the north. They are followed by birds of prey. Water birds also are continually passing, so that from August until the ponds and rivers freeze, the vast and changing concourse moves on. Look for land birds in the fall, on the fair, warm days, or "weather-breeders," just before storms. In clear nights they may be heard passing overhead. They are then fleeing from the "wrath to come." Easterly storms now bring wading and swimming birds.

Thrushes may be found in sheltered swamps and in woods where late maturing berries grow. Birch plant lice sometimes furnish food for Warblers, Blackbirds, and Sparrows in autumn until heavy frosts come.

Sparrows now depend mainly on weed seeds, and may be found in sheltered, weedy cornfields and gardens, along roadsides, or in bushes on sunny hillsides where they can find shelter from strong winds. Weedy places are frequented by Bob-Whites also. The Ruffed Grouse or Partridge now seeks wild-apple trees, and feeds also upon barberries or wild grapes.

There are associations of birds in spring, autumn, and winter that the watcher should examine and study carefully. Red-winged or Rusty Blackbirds, Starlings, Cowbirds, or even Meadow-larks may mix with a flock of Grackles or with each other. Flocks of common Warblers or Sparrows should be looked over carefully, as there may be some rare species among them. Never neglect the notes of the Black-capped Chickadee in the seasons of migration. Then and also in winter other birds may be with or near the Chickadees. All companies of Chickadees should be examined in winter to see if there are any Brown-capped Acadian, or Labrador Chickadees with them. Flocks of Slate-colored Juncos may contain one or more of the rarer western forms. In winter Goldfinches, Redpolls and Siskins sometimes accompany each other in feeding, and even flock together.

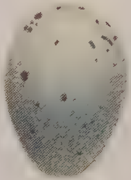
Winter Birds

Birds may be found in sheltered places all through the winter. The Snow Bunting, however, habitually seeks open, grassy fields, far from all cover. Many birds find winter shelter in pine thickets, or roost in cedar swamps. A farm-yard with a dense growth of coniferous trees close at hand, with thickets or bushy roadsides nearby, should be good hunting ground. In winter birds often seek a thicket in some valley or ravine

EGGS OF AMERICAN BIRDS

PLATE I

1. CEDAR WAXWING
2. RED-EYED VIREO
3. WHITE-EYED VIREO
4. WARBLING VIREO
5. PHAINOPEPLA
6. BLUE-HEADED VIREO
7. BELLS VIREO
8. BLACK AND WHITE WARBLER
9. PROTHONOTARY WARBLER
10. WORM-EATING WARBLER
11. BLUE-WINGED WARBLER
12. ORANGE-CROWNED WARBLER
13. PARULA WARBLER
14. MAGNOLIA WARBLER
15. YELLOW WARBLER
16. WATER RUSH
17. YELLOW-THROATED WARBLER
18. PRAIRIE WARBLER
19. MARYLAND YELLOW THROAT
20. OVEN BIRD
21. YELLOW-BREASTED CHAT
22. CHESTNUT-SIDED WARBLER
23. HOODED WARBLER
24. REDSTART
25. PIPIT



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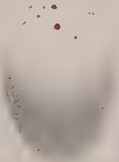

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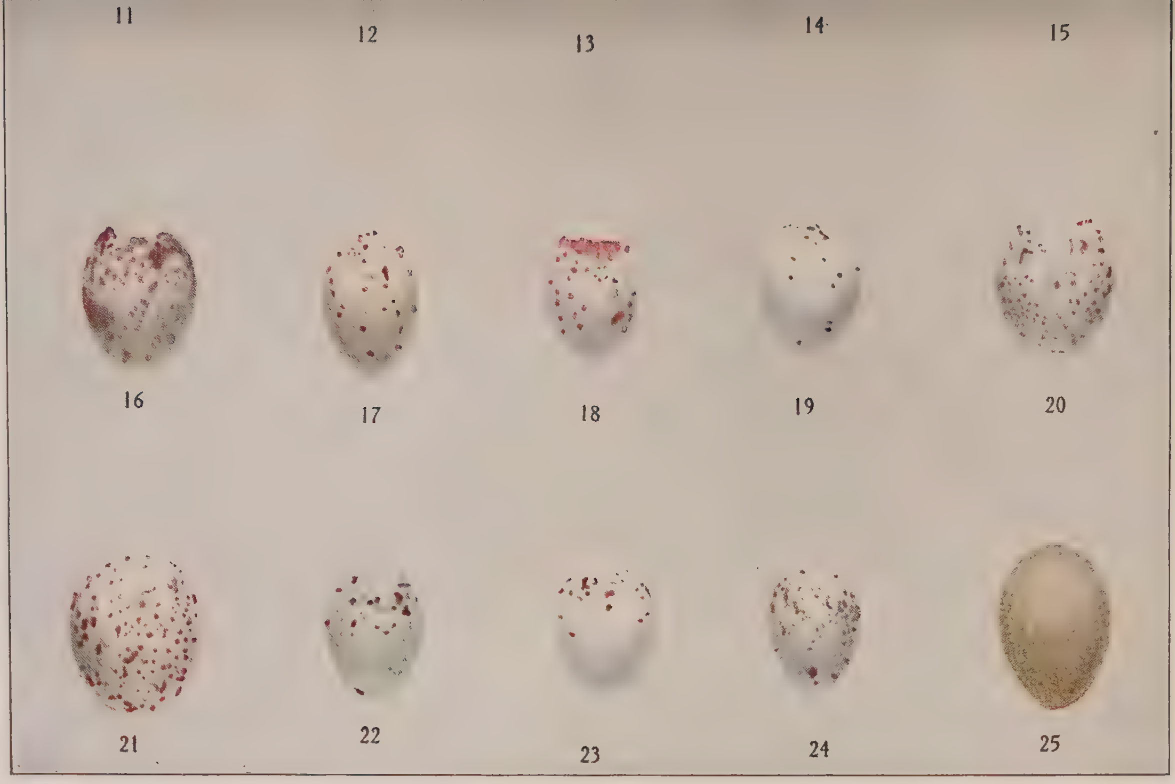


EGGS OF AMERICAN BIRDS (PLATE I)

along a stream in preference to high open woods. A long thicket at the foot of a southern slope of a wooded hill next to a meadow makes a good winter refuge. Sheltered, tangled patches of goldenrod and other weeds, old gardens, sheltered low pastures overgrown with brushes, alders, and birches, and all places where people feed birds should be examined in winter. One who knows the natural food of winter birds and where to find it has a great advantage. For example, Crossbills frequent larch, pitch pine, spruce and other coniferous trees when these trees bear seed. Goldfinches and Redpolls feed on the seed of the common birch. Many birds feed largely on berries produced by shrubs, vines, or trees that retain their fruit in winter.

Hawks and Owls

Great Horned Owls may be found where Hares or Rabbits are abundant, or about Crow roosts. Crows will often tell you where a Great Owl is hiding. At such times the Owl may be seen, if the observer can approach very skillfully under cover, moving only while the assembled Crows caw, and stopping as they cease. Horned Owls, Snowy Owls, and Barred Owls are most often seen in winter. These birds may be observed at times in sparsely wooded country, in open fields, or rarely, in villages. The Snowy Owl is most commonly seen along the coast or in open fields or pastures.

Birds of prey return year after year to the same spot to nest. Having once found a nesting place of Eagles, Hawks, or Owls, you may look for them with confidence year after year on the same cliff or tree, or in the same patch of woodland. The Horned Owl nests in February, or early March, usually in an old Hawk's nest, or in a hollow tree near a swamp; often the nest is not hard to find. The Barred Owl nests in March and April. Red-shouldered Hawks and Red-tails nest in April, and most Hawks build their nests before the leaves are fully out. Groves of tall white pines are favorite nesting places for Hawks. Hawks rarely if ever use dead leaves in nest building, although some use a few green leaves, so the numerous nests seen filled with dead leaves may be attributed to Squirrels. Sometimes, however, a Hawk or an Owl will build upon the foundation of an old Squirrel's nest or a Crow's nest. Some observing farmers can point out to inquirers a locality where Hawks nest. Often the nest is not far from the edge of the woods, and an observer watching from a distant hillside may see the bird fly directly to it. Usually with a good glass one can distinguish a newly occupied nest by its fresh appearance and bits of fluffy, light-colored down clinging somewhere about its edges. Some Hawks and Owls sit very closely, and can hardly be driven from the nest by pounding on the tree. Others leave at the first alarm.

The Long-eared Owl commonly is a close sitter. When one has discovered an occupied nest, the chances of watching the occupant from a blind depend on conditions, but while the young are growing the parents are continually going and coming. At such times Owls may be seen on the afternoons of cloudy or stormy days.

In severe winter weather Screech Owls sometimes enter barns, where they kill mice or doves. They nest in April, often in an old, hollow orchard tree. You may sometimes find a Screech Owl sitting on a limb in daylight or at dusk. If the Jays or the smaller birds find it, they will tell you where to look. Jays seem to delight in mobbing a Screech Owl, and telling everybody all about it.

The best time to observe the Hawks in flight is in September, when they are on their southward migration. A great flight usually goes over near the middle of the month; then one must watch the sky.

Bird Ventriloquists

The bird seeker must learn to notice every sound and movement in the woods and fields. He must try to follow every strange note to its source. The expert usually hears a bird before he sees it. Some birds are ventriloquists; when the bird is hidden by the leaves, the song seems to come first from one tree and then from another. For this reason the Scarlet Tanager may sometimes be found by going around the place from which the sound of its voice seems to come, or by passing by it, and then returning to it.

Many birds have the power of singing so softly that they seem to be far away when really just at hand. The Catbird does this quite commonly, and many other species occasionally sing their full songs in the fall as in the spring, except that they are audible only a few yards away. In mild autumns, or on warm days, some birds sometimes sing almost as well as in the spring. To find birds one must cultivate the senses of sight and hearing to the utmost.

How to Identify Birds

Naturally, he who begins to study birds, having found one new to him, desires first to know its name and to be able to recognize it at sight. This is the A B C of bird study—the mere beginning—but nevertheless important.

Bird Names

Whoever travels much will find that the names by which certain birds are known to the people change as he passes from place to place. The

Flicker has more than forty common names in different localities. Some of the shore birds are known by one name on one side of a sound or river, and by another on the opposite shore. Bird names may change as one goes from one township to another. Certain individuals in a town may have one name for a bird, while other townsmen know it by a different name. Uniformity of names is so obviously a practical convenience that ornithologists try to stabilize and simplify the study by giving to each species a fixed cognomen derived from the Latin or Greek, by which it may be known to all ornithologists in any country. Also in the United States ornithologists have adopted a common name for each American bird, by which both ornithologists and the people generally may know it in its native country. The American Ornithologists' Union has established rules of nomenclature for the purpose of fixing the technical names of birds, and these rules have proved so efficacious that they have been largely adopted by zoölogists everywhere. If these tenets be followed faithfully each species eventually will have a fixed name by which it will be known everywhere. Unfortunately, synonyms have multiplied until they have become the despair of the beginner, who prefers, instead, such vernacular names as Robin and Bluebird, which have become stable and widely used and recognized. The American Ornithologists' Union has turned its attention, also, to stabilizing the common names of birds, and both common and technical names for each species are published in the Check List of the Union, which is the recognized authority for names of North American species; but even now changes not infrequently occur. Fixity in the names of species might have been reached before now, as it is some years since a new species of bird has been observed in North America, but an increased acquaintance with the classification of the birds of the world, also with the early literature of ornithology, and the names in use in other departments of zoölogy, have necessitated many changes in order to conform with the rules. Also the specimens of birds in public and private collections have never been sufficient in number or representative enough geographically to give the systematic ornithologist the material necessary for final and accurate determination. The continual discovery of new sub-species, as material in ornithological collections has increased, has called for new names, and has required continual changes.

Species and sub-species of the same genus differ in appearance from each other mainly in color and size. In the early history of ornithology the species was the unit, but more recently the comparison of many individuals of a species from different parts of its range has led to a recognition of minor differences in size or color, or both. For example, individuals from the northern part of the breeding range of a species may be larger and lighter or darker in color than those in the southern part while those at midrange may show size and color intermediate between the two. The two or more geographic forms of a species exhibiting fixed differences are therefore described as races of sub-species,—as Caucasians, Mongolians, and Negroes are characterized as races of man. Ornithologists in naming these races now use the trinomial, or three-name, system. The generic and specific names together denote the species. The name of the genus comes first, and is capitalized, the name of the species second, and that of the sub-species third. As, for example, the Robin: *Planesticus migratorius*. There is but one species of Robin in North America. There is a recognized western race of the Robin known as *Planesticus migratorius propinquus*. Consequently, we apply to the Eastern Robin the nomenclatural equivalent: *Planesticus migratorius migratorius*. Then, again, there is a small pale southern Robin now known as *Planesticus migratorius archrusterus*. Here is but one Robin represented by three sub-species. The differences in size and color are not very great. Why, then, recognize races at all and dignify them by names? To this it may be answered that as we advance in the study of ornithology we are driven to trinomials by the fact that some species are now known to have many geographic races, some one of which may differ far more from some other in size and color than do certain distinct species, and yet there are connecting links between all of these races.

If we take another common and widely distributed bird, the Song Sparrow, we find that at least twenty-three races of this species are now recognized, and if we compare the small, pallid, Desert Song Sparrow with the large, dark Aleutian Song Sparrow we find that these two races of one species differ in size, shape, and color more widely than do such distinct species as the Song Sparrow and Lincoln's Sparrow. There is even more apparent difference in appearance between these two races than the novice will see between the Eastern Song Sparrow and the Fox Sparrow—birds not only of different species, but also assigned to different genera. Nevertheless, the Pallid or Desert Song Sparrow and the Aleutian Song Sparrow are connected by a chain of sub-species.

Genera and species are not immutable. Many of the distinctions of the past represented mainly the gropings of the human intellect in a new field. Now minute differences are more carefully noted. Some of the former genera are now regarded as species, and some of the former species are considered as mere races. There is perhaps no fixed and universally accepted definition of just what constitutes a sub-species, and in the finer points of classification ornithologists do not always agree; also there is a constant evolution going on in nature. Many of the races now recognized may be species in the making. If for any reason the connecting links in the chain of sub-species between the Pallid or Desert Song

Sparrow and the Aleutian Song Sparrow had disappeared, these two birds would probably be recognized as well-marked species. Years ago the Heath Hen (now extinct except on the island of Martha's Vineyard, Massachusetts) and the Prairie Chicken were considered by Audubon as one species, and described as the Pinnated Grouse. Since that time all connecting links between the eastern bird and the western bird have been extirpated, and now we have two distinct species. On the other hand, the Western Meadowlark, *Sturnella neglecta* of Audubon, is now considered by some ornithologists to be no more than a race of *Sturnella magna*, of which we may perhaps have to record three principal North American forms: *Sturnella magna magna*, the Eastern Meadowlark; *Sturnella magna neglecta*, the western race; and *Sturnella magna argutula*, the southern form. This is a possibility, not a prediction. Who can say what systematists may do? Already several additional forms of the Meadowlark have been described. By describing and recording each geographic race we may some day throw more light on the evolution of species.

What names, then, must the novice choose, who does not care to collect birds and preserve their skins, but wishes only to name the birds without a gun? He should use the vernacular names given in the last edition of the Check List of North American Birds, published by the American Ornithologists' Union. These names are now utilized by practically all publishers of bird books in the United States, but only the most recent editions are up to date.

The student of birds in the field will do well, at first, if he is able to recognize the species, leaving the sub-specific determinations to a later period, when he will have the advantage of longer study and experience.

Field Glasses and Other Helps

To learn to identify birds readily the student needs keen eyes and ears, an opera glass or field glass, a notebook and pencil, a color key and a book with colored illustrations, and some training in careful observation. It will be a great advantage if there is a museum accessible, where he can see mounted specimens; or a library where he can find the more pretentious works on ornithology that contain colored plates of birds. A small, light-weight opera glass is all that is necessary for viewing the smaller birds at close range. The expensive prism binoculars, magnifying many times, are excellent for the adept, but the beginner with them will have difficulty in finding the bird at all. The 8-power binoculars are excellent to use in the open, and on rather long-distance work, especially at the seashore, and they have an arrangement for adjusting the eye-pieces to all eyes; but where a bird is skipping about among the branches of trees in the woods. it will often disappear while the novice is trying to follow it with such a glass. A common opera glass of good quality, with a larger field of vision and magnifying about three times, will do very well for ordinary use. Each glass should be tested before purchasing, and the purchaser should, if possible, select a glass with the eye-pieces so adjusted that in using it he can see but one field. If he sees "double" the glass is "out of line." For waterfowl or sea birds a marine glass is useful.

To learn the proper use of the opera glass, select some bird in the open that is sitting still, if possible. Have your back to the sun, so that it will shine directly on the bird. Focus the glass on the tree, and then find the bird by noting the position of the branch and sighting the glass as you would a gun.

Points to be Noted

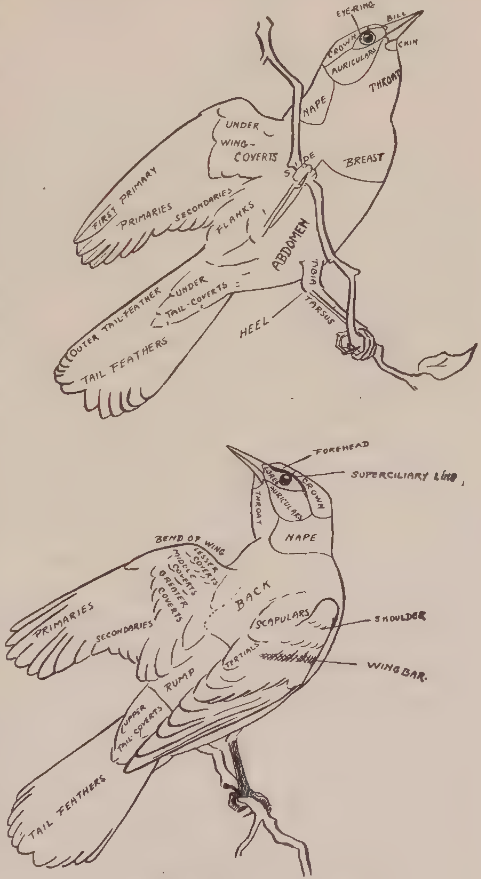
Note the size of the bird. It will be difficult at first to judge this size in inches, but you may compare it with certain common and well-known birds. You may have a scale of sizes, beginning with the Yellow Warbler or Chipping Sparrow, and reading like this: Chipping Sparrow, Song Sparrow, Bluebird, Catbird, Robin, Dove, Crow. Observe these birds well, and note the size of each. Turn to your book and get it in inches. Write it down; commit it to memory; have it always in mind. By making good use of such a scale, you may become expert in judging size by comparison.

Next, the shape of the bird is important. Note whether the bird as a whole is slim or stout. Some allowance may be made regarding how the feathers are carried at the time. All birds can raise or lower the feathers of the body at will. They are likely to appear plumper on cold days than on warm ones. The bill is an important diagnostic feature. Few people who describe birds to me in the hope of having them identified ever mention the bill. If you can see the shape of the beak, you may be able to refer the bird at once to the family to which it belongs. If it is not much larger or smaller than a Song Sparrow, and has a short conical bill, it is a seed-eater, probably a Sparrow. If it is a little smaller than a Song Sparrow, or about the size of a Chippy, and has a rather short but slender bill, nearly straight or a trifle curved, probably it is a Warbler, or belongs to some other insect-eating family. Flickers, Cuckoos, Thrashers, and Creepers all have rather slender curved bills. The bills of most Woodpeckers are stout and straight; those of most Sandpipers are slim and straight, while the bills of Plovers resemble those of Pigeons and Doves.

The length and shape of the tail are important. Try to see whether the tail is long or short, and whether the end is rounded, square, or forked. If the bird is large, with a hooked beak and long tail, probably it is a

Hawk: If the beak is long and straight, or nearly so, the tail short and the legs long, it must be a Heron, or some other wading bird.

The color of the bird is very important; indeed, it is about the only feature ordinarily observed. First, if possible, note the color of the upper parts, i. e., the top and sides of head, back and sides of neck, back, wings, and tail; next that of the under parts,—throat, front of neck, breast, and belly Remember that the breast and belly often will seem darker than they really are, on account of being in shade. Thus a pure white will seem gray. Many birds have some prominent mark or color by which they may be identified in the field. Be careful to note just where each color actually is; then note any conspicuous mark, and exactly where it is placed, for such a mark alone, taken with its situation and the size of the bird, often is enough to establish its identity. The Vesper Sparrow, for example, is known from all the other common summer Sparrows by the white webs of the two outer pairs of tail feathers, which show in flight; while the Junco may be known from other winter Sparrows by a somewhat similar marking. The Song Sparrow shows a cluster of spots which form a



TOPOGRAPHY OF A BIRD
FROM A DRAWING BY HENRY THURSTON

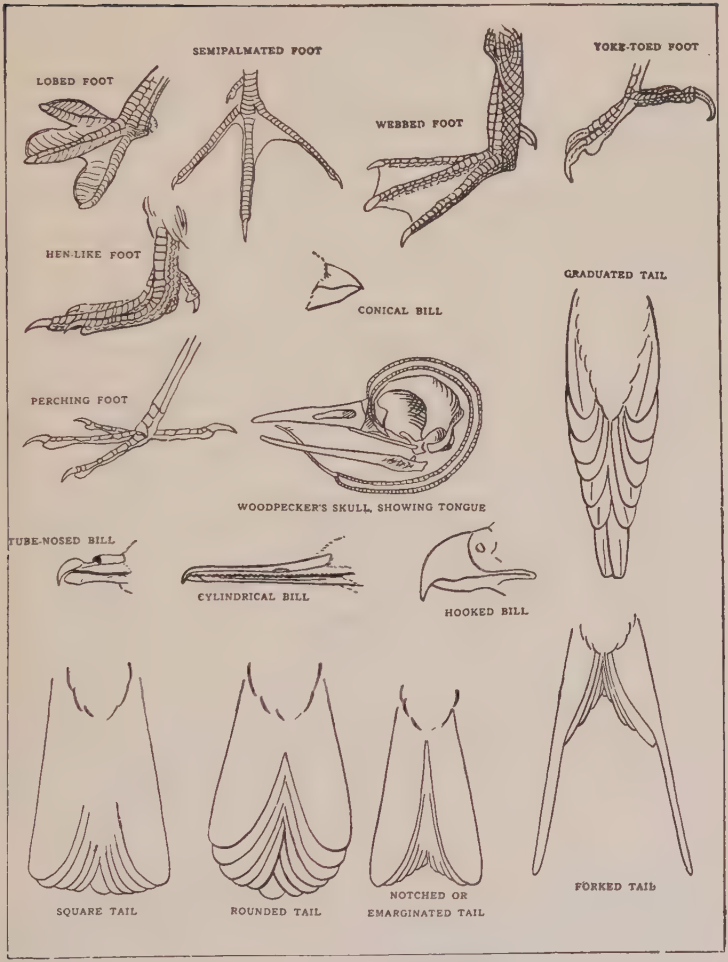
blotch on its spotted breast just below the throat, while the Tree Sparrow has a single spot on a plain gray breast, and two whitish wing bars. The Flicker and the Meadowlark each have a black crescent on the upper part of the breast, but the Flicker's breast is dotted, while the Meadowlark's is a clear yellow. The color of the bill or feet may sometimes aid in identifying a bird.

The Note-Book

In this work the note-book and pencil are indispensable. The effect of noting down details on the spot is to sharpen the powers of observation and strengthen the memory. Then, also, you have something permanent to refresh your recollection. Note down on the spot, size, shape, color, and markings, also shape and appearance of beak and tail (when you can see them), for future reference. This will help you to identify the bird, and to fix its identity in your memory, or, if you carry a handbook with colored illustrations, look up the bird at once, so as to settle the matter by further examination of the bird, if possible. Remember, however, that no handbook gives color plates of all plumages of all the birds.

The note-book should be marked as follows, or in some very similar manner (the large type indicating the heading to be written in the books, and small type the records to be made):

Date—
Month, day, and year when observed.
Size—
As directed above.
Description—
See the accompanying chart of the Topography of a Bird and the drawings of tails, feet, and bills.
General Color above
General Color below
Forehead Crown
Nape Back Rump
Chin Throat Lores
Breast Abdomen
Tail: Color Shape
Bill: Color Shape
Wing: Color Shape
Feet: Color Arrangement of toes
Movements—
Hop, run, bob head or tail or both, sit quietly or flit about continuously, nervous or deliberate.



FROM A DRAWING BY HENRY THURSTON

Flight—
Direct, zigzagging, diving, sailing, wavy, or combinations of these.

Song—
Harsh, sweet notes long drawn out or in series, variety of notes, one or more calls, call in flight or at rest or both; what does the bird seem to say in our words?

Habitat—
Trees (high up or low down), shrubs, ground, buildings, water.

Localities Frequented—
Meadows, forests, orchards, homes, foot-hills.

Food—
Insects, grain, fruit, seeds, vegetables.

Economic Value—
Is this bird useful or useless?

Remarks—
Points not covered by this outline

From these observations, stories can be written like those on the following pages.

The expert can determine many birds at a distance by their characteristic flight. An ornithologist, constantly in the field, can identify many a bird by its flight alone at a distance greater than that at which most people can recognize a friend by some peculiarity of his gait; and the beginner, by making good use of his opportunities, will soon learn to recognize a Buzzard Hawk such as the Red-tail by its wheeling flight, or a flying Green Heron by the downward bend of its wing tips. All Woodpeckers bound forward in flight, as they travel by rising for a few wing beats, and then sliding downward with the wings partly closed. The Goldfinch also has an up-and-down flight. The gait of the bird on the ground may determine the species or at least the family. Crows, Grackles, Blackbirds, Ovenbirds, and some others walk, while most birds progress by hopping, although now and then a hopping bird may surprise you by walking a few steps on clear, open ground. The Pipit, the Yellow Palm Warbler and the Water Thrushes all wag the tail up and down while moving about,—something not habitual with most other birds.

Bird Notes as a Means of Identification

The notes of birds serve as an excellent means of identification, although there are a few birds which can imitate well the notes of others. Among these are the Crow, Blue Jay, Catbird, Brown Thrasher, Starling, and the famous Mockingbird. The note furnishes a clue to the presence of the bird, and assists the searcher in his quest, but if he relies on the note alone he may be mistaken. No rare bird should ever be identified and recorded by its note alone. I have seen a Black-throated Green

Warbler in the act of singing continually the full song of a Warbling Vireo, a Blue Jay singing exactly the song of a Baltimore Oriole, another reproducing the whisper-song of the Catbird in October, and a Catbird giving the note of the Crested Fly-catcher. The Blue Jay often utters a cry like that of the Red-shouldered Hawk.

I have heard from the marshy border of a river notes exactly like some produced by the Flicker and the Bob-White, which I was forced to attribute to a Sora Rail. Mr. Henry Oldys of Silver Spring, Maryland, informs me that he has heard the note of the Towhee given by a Bewick's Wren and a Song Sparrow; those of the Cardinal Grosbeak, Wood Thrush and Red-winged Blackbird by the Catbird; those of the Phœbe by a Shrike and a Chickadee (not the so-called Phœbe song of the Chickadee, but a much closer imitation that so deceived him that he recorded the Phœbe's arrival prematurely for four successive years). He asserts that he has seen the Black and White Warbler utter the note of the Chipping Sparrow, the Red-eyed Vireo imitate the Wood Thrush, and the Yellow-breasted Chat mimic the Bob-White. The European Starling is fast becoming abundant. It mocks the Meadowlark and other birds, and there are Starlings with powers of mimicry second only to those of the Mockingbird.

As a novice will see colors in the wrong places, or fail to see colors in the right places, so he will hear birds wrongly, or fail to hear them at all.

Day by day people canoeing on the river pass my window, while the note of the Bittern booms over the river meadows. It may be heard a mile, yet they never hear it; or rather, they are not conscious of hearing it, or they mistake it for the sound of a wooden pump. As evening falls, Night Herons call and croak along the river, but these people do not hear the raucous cries, or rather, they do not notice them, or perhaps they ascribe them to dogs. The student of birds soon learns to distinguish such sounds as these, but he cannot realize immediately that the song of the Grasshopper Sparrow is not that of one of the insects of the field, nor does he learn at once to hear the faint chirps of migrating hosts of Wood Warblers which pass over or through the country twice each year nearly unnoticed.

An ornithologist if stricken blind, but endowed with perfect hearing, might still get an approximate idea of the number of birds of most species resident in a locality, for most birds are vociferous at times, and some much of the time.

Many people, however, have great difficulty in recognizing or remembering bird notes. Others are afflicted with tone deafness, and are unable to differentiate between tones and calls of an entirely different quality. Many persons of middle age who can hear ordinary conversation cannot distinguish the notes of Warblers and other small birds at a distance, as all such notes, pitched higher than the upper octaves of the piano, are of such fine quality that they make little impression on the eardrums of those whose hearing is at all impaired.

In studying bird songs the note-book is indispensable. Write down in syllables what the birds seem to say as you hear it at the time. Accent it as the bird accents it, and if you are musical you may even get an approximation of it by note. These notes may refresh your memory, and help fix the call or song in your mind.

Birds do not really articulate, or if they do, the sounds are mostly vowels: yet we may imagine that they enunciate words. In learning the songs of birds one may take the notes of some common loud singer, like the Robin, as a standard, and by comparison determine how those of other species differ from it. This is good training for the ear. Some people cannot see any difference at first between the songs of the Robin and the Wood Thrush, but to the initiated they have nothing in common. In quality of tone beginners usually see little difference between the songs of the Baltimore Oriole, the Robin, the Scarlet Tanager, and the Rose-breasted Grosbeak. Nevertheless, the Oriole's lay is almost a pure whistle, the tune varying much with different individuals; the Robin's song is a bold warble, a little strident in places; the Tanager sings a weaker, finer note, like an undeveloped, hoarse Robin; and the Grosbeak has a beautiful clear warble, rather loud at times, but perfectly pure and mellow.

Unfortunately for the novice, a bird may have two or more distinct songs. Some commonly have many, while rarely do two individual birds of a species sing precisely the same tune; but this disparity only makes the study of their vocal powers more interesting. Occasionally a very gifted individual will eclipse the performance of all rivals. The caw of the common Crow is well known, but its love notes and its conversational abilities when ministering to its young are seldom recognized In early spring or late winter the Crow often gives forth quite musical sounds, and I have heard one closely imitate other birds and animals, though this is probably exceptional. Many singers not ordinarily gifted have beautiful flight songs. It is not generally known that individual Meadowlarks are fine singers when in flight.

Trying out the Plan of Identification

Now to put our plan of identification to the proof. We are boating some cloudy afternoon along the margin of a river meadow. We enter an opening crowded with lily pads, where a small slough opens into the stream. A bird larger than a Crow flies up from among the reeds; its long, nearly straight beak, its short tail, its long legs, hanging down at the start, and its manner of flight, with neck extended at first and then drawn in, proclaims to the world that it is a Heron. It appears to be ash gray above, whitish below, but looks blackish on the crown and back. As it flaps heavily away it sends back a loud *quock*. We have seen enough to learn from our key that the bird is an adult Black-crowned Night Heron. Soon another flies. It appears like the first in size, but it is rich brown in color above and lighter below, streaked and mottled. Its note is a croak, not nearly so explosive as that of the first bird, and it flies a little slower. Our book tells us at once that we have seen the American Bittern, even if we have failed to observe the black streak on the side of the neck. As we drift on down the river, a startling *scowoo* comes from the trees on shore, followed later by a few dry cacklings. Then a smaller Heron, that appears hardly as large as a Crow, flies out over the river, with a harsh *squawk* or *quak*, and down along the shore. Its wing strokes are rather quick, but there seems to be almost a pause between strokes when the wing is held with downward-bending tips. In color the bird seems dark, with a greenish back and bluish-green wings. Its size, flight, note, and color proclaim it an adult green Heron. Soon another bird, resembling the Night Heron somewhat in size and color, is seen flying low over the meadow, coming upstream. As it comes abreast of our position we can see with the glass that there is no long bill, neither are there any long legs dangling behind, nor is there any blackish tone on the back, but the bird has a long tail and black wing tips. It moves in silence, and now it hovers over a tussock, dives into it and goes on. The screaming Blackbirds chase it across the meadow. This is no Heron, but a Hawk; its size, larger than a Crow, its color, light ashy above and nearly white below, its black wing tips,—all show it to be an adult male Marsh Hawk. One of the best field-marks of the Marsh Hawk, both male and female, is the white upper tail-coverts. Thus we see how a few well-marked characters may enable us to identify our birds.

As one advances in the study, the manner in which birds feed, the character of the locality in which they are found, the location and construction of the nests, the size and color of the eggs—all tend toward fixing the identity of the birds.

It is well, before going to a marsh or lake, the seacoast, or a dense forest, to "read up" on the birds to be found in such localities. A key to the birds, with a system based on the colors and markings, will be serviceable, particularly to those who are not intending to study ornithology scientifically, and have no opportunity to handle and examine specimens. The work of identification will be difficult at first,—far more difficult than it would be in the study of botany or geology, for the birds will not always stay to be studied. But in time one learns to recognize many species at the first glance, until, almost unconsciously, he comes to a time when most of the birds he sees or hears are old friends. With me the day has long since passed when new birds could be seen or heard almost daily. I have traveled thousands of miles and have endured many hardships to see and hear new birds. But you who are just beginning this study may meet a new bird any spring day merely by walking out into the pleasant fields and green woods. For you the keen delight of search, discovery, and pursuit are close at hand. Surprises await you at every turn. Delay not, then, but turn at once to the woods and fields.

HOW TO APPROACH BIRDS

Even the novice need not be taught how to approach the more common and familiar birds, which seem to court, rather than shun, human companionship; but there are times when it becomes necessary to get close to a rare bird, to examine it carefully or observe its habits, while a near approach to a shy bird may tax the powers of the most skillful observer.

The Approach on Foot

To be successful in this the beginner must imitate in some respects the behavior of the fox or the lynx, which are able occasionally to get near enough to wild birds to capture some that the human animal finds difficult to get within range of his field glass. How are the wild animals enabled to do this? (1) They are inconspicuously or protectively colored. (2) Their feet are softly padded and their movements noiseless. (3) They go on all fours, creeping close to the ground, and, taking advantage of the slightest cover, keep concealed as much as possible. (4) Their movements are so slow, when necessary, as to be imperceptible. In all these things we may imitate them.

Bird students often are dressed conspicuously, and shod with hard leather. Their tread, as it jars on the delicate senses of the lower animals, seems to shake the ground. The dead wood is broken underfoot. They talk, laugh, and even shout with a loud voice. Standing erect, they are exposed to the view of birds for a mile or more around. Some of them wear large head-gear, and turn their heads about quickly. They swing their arms, and move about, pointing, gesticulating, and assuming attitudes all of which seem menacing and fearsome to the shyer birds.

Even such students will see birds, for many of our feathered friends have become accustomed to strange sounds and antics. But the expert who sees all the birds has taken lessons from the fox; he hunts alone.

When one is in the company of others, nature never completely enthralls him. His attention is more or less distracted by his companions, and he fails to see and hear all.

The bird student should attend entirely to the birds, and then they will requite his singleness of purpose. When alone, he has no one to converse with and no interruptions. The human voice warns all creatures from afar of the approach of their arch enemy, man; let it be stilled, and nature is at peace.

We may muffle the tread by wearing rubbers, or, better, shoes with rubber heels and rubber or fiber soles. Those having merely an outer lift and tap of rubber on heel and toe are best. The rubber will prevent the feet from slipping on rocks and pine-clad hillsides. The light canvas "sneakers" commonly used are not sufficient protection to the feet on rough, stony ground. Leather footgear should not be stiff or squeaky. We may avoid the rustling of dry leaves by choosing for our tramps the early morning, when the dew is on, or the hour succeeding a light shower. Care should be taken not to tread on dry sticks so as to break them, as sharp sounds alarm all wild creatures.

In dressing avoid black, white, and all striking colors and contrasts. A dull dead-leaf color, like that of the shooting coats ordinarily sold to sportsmen, is good at any time. In spring and summer green is very good. Certain grays and browns harmonize with natural objects.

The vision of most birds is far superior to our own, or that of mammals; it is nearly, if not absolutely, perfect. Therefore, it is necessary in approaching shy birds, such as waterfowl or Hawks, to use as cover trees, shrubs, or grasses. Often one can advance only on hands and knees, or crawl prone like a serpent.

Frequently I have approached wild fowl by creeping in the paths made by Raccoons, Hares, Opossums, and other animals under grasses and low shrubbery. At other times I have been obliged to creep or wriggle through short grass, in mud and water, to reach some desired point of observation. In such cases, when within sight of the birds, a screen of vegetation must be kept always before the face, or the birds will take alarm and be off at once. Birds so wild that they will not allow a man on foot to come within half a mile may be approached noiselessly in this way within twenty or thirty yards, but the labor and discomfort are great.

When nearing shy birds in this manner, keep under cover and do not raise the head. If it becomes necessary to take an observation, the head must be raised but little, and both raised and lowered so slowly that the motion will be imperceptible. Always approach against the wind, if possible, for the birds are then less likely to hear you. Do not allow the sun to strike on any metallic or glass object, for the reflection or flash will give the alarm.

Many people will not take such pains in approaching birds. Others cannot, but must either decoy the birds within reach, watch them with long-range glasses from wooded shores, or get up to them in less difficult and more conventional ways. Such people may see shy birds sometimes at rather close quarters by driving slowly along the country road. The extra elevation given the observer by the vehicle increases his visual possibilities, and the birds have learned not to be suspicious of an equipage on the road. Birds sometimes may be approached on horseback better than on foot. Gunners sometimes employ grazing cattle as moving shields behind which they near the game unnoticed.

When approaching shy birds on foot in the open, a zigzag, circular or sidelong course may bring you much nearer than will a direct forward movement. It is well to avoid the appearance of stealth, and seem not to notice your bird. Make no quick movements, and do not hurry. Most birds meet violent deaths, and they must be constantly on the watch for their enemies. They are accustomed to flee for their lives from quick-moving creatures. Quick movements with the raised arms should be avoided, and the glass should be raised slowly.

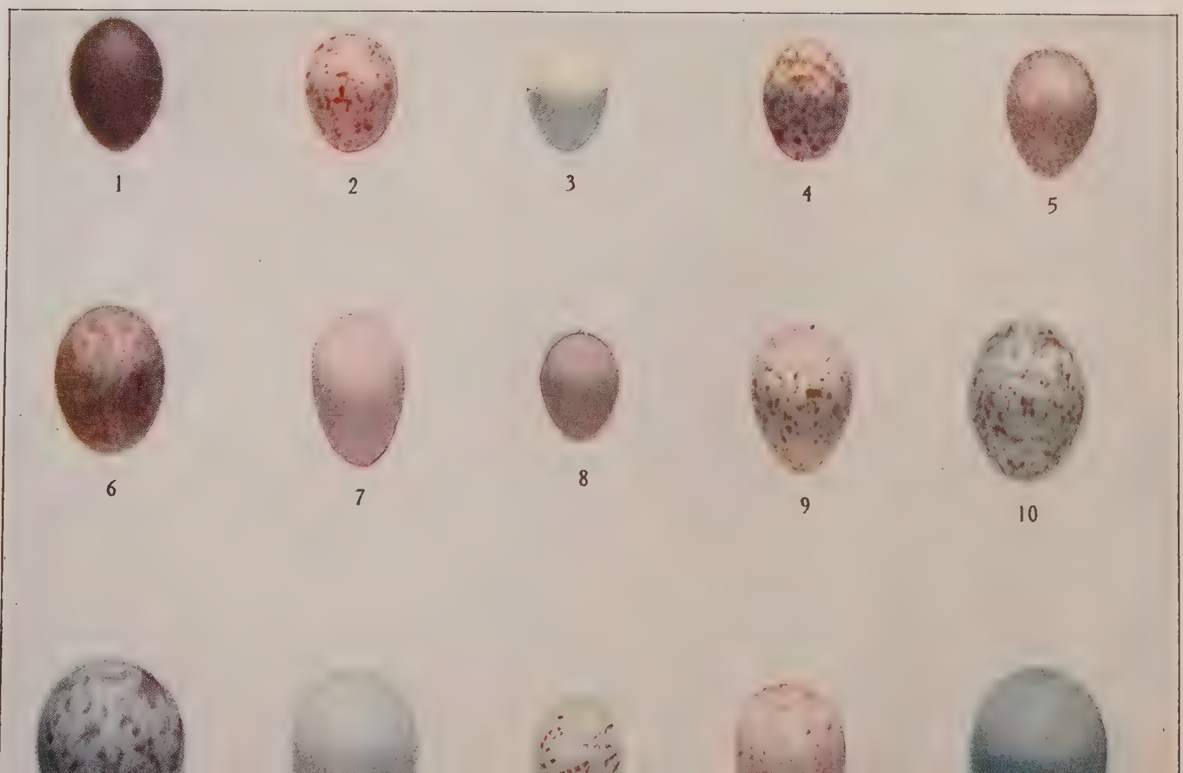
The Use of Canoes or Boats

Shy water birds and marsh birds sometimes may be approached by the skillful use of a canoe. Let the canoe drift slowly along the marshy margin of a river, and watch the reeds and rushes closely. In this way Rails, Coots, Gallinules, and Sandpipers are seen at close range. I have approached very near to resting flocks of shore birds by sitting or lying motionless in an Indian canoe, and drifting down upon them. The canoe may be used to advantage on a river, not only in watching Bitterns, Rails, and other marsh birds, but also in going close to the smaller land birds in trees and bushes on the bank. For this purpose the canoe is much superior to the rowboat. It is noiseless and the paddler faces the bow. Many birds may be seen at close range by working a sailboat up or down a river before a light, fair breeze. A small boat covered with bushes, and sculled or allowed to drift down on birds, sometimes is useful. A fast-sailing boat is one of the best devices for approaching swimming birds on a windy day. Such a boat maneuvered skillfully will be upon the birds before they are aware of its nearness. During a squall I once drove a sloop so near a Sheldrake that the bird rose on the next sea as we swept past. There is an advantage in sailing down wind, as the bird must rise toward you against the wind, and may come quite near, giving a good view, first of the breast and then of the back as it

EGGS OF AMERICAN BIRDS

PLATE II

1. LONG-BILLED MARSH WREN
2. CHICKADEE
3. BUSH TIT
4. BROWN-HEADED NUTHATCH
5. HOUSE WREN
6. SHARP-TAILED SPARROW
7. BANK SWALLOW
8. GOLDEN-CROWNED KINGLET
9. BARN SWALLOW
10. SONG SPARROW
11. ROSE-BREASTED GROSBEAK
12. BLUE BIRD
13. BLUE-GREY GNATCATCHER
14. WHITE-BREASTED NUTHATCH
15. WOOD THRUSH
16. ABERTS' TOWHEE
17. BENDIRE'S THRASHER
18. OLIVE-BACKED THRUSH
19. BLUE GROSBEAK
20. CARDINAL
21. MOCKING BIRD
22. CATBIRD
23. BROWN THRASHER
24. ROBIN
25. CALIFORNIA THRASHER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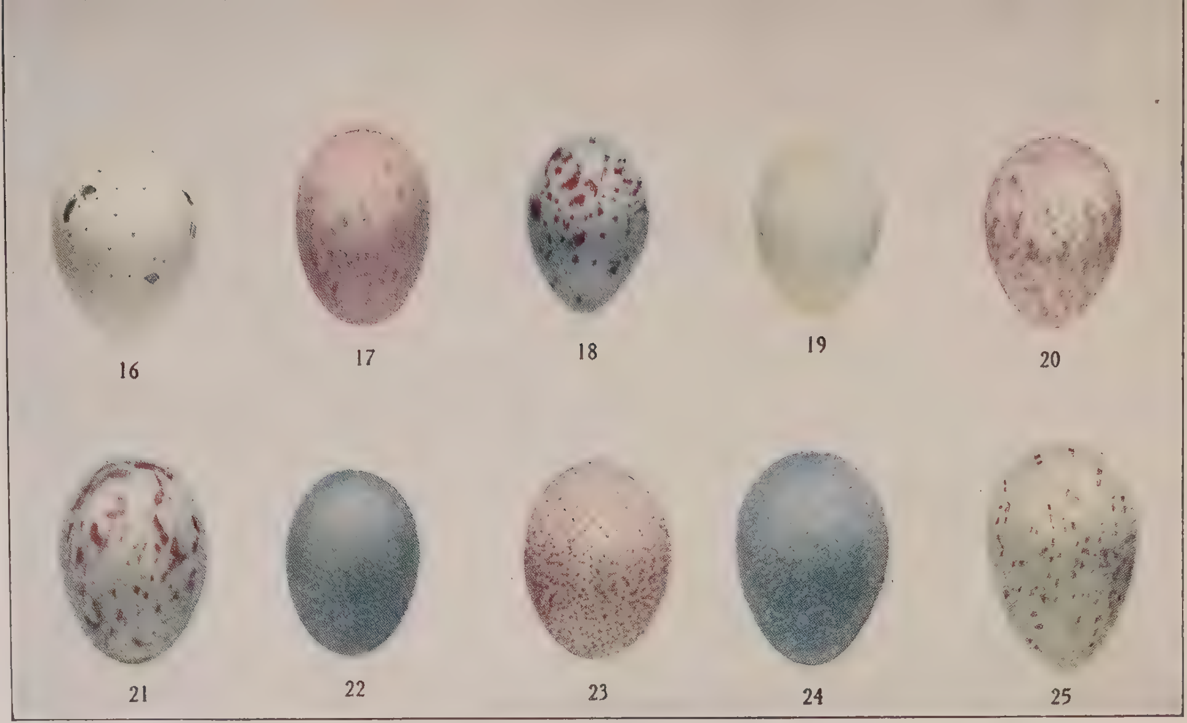

EGGS OF AMERICAN BIRDS (PLATE II)

turns away. The noisy motor boat is the abomination of the bird student. It has driven most of the waterfowl from our eastern rivers.

Watching Birds' Nests

When birds have young in the nest they usually are less shy than at other times, forgetting their regard for their own safety in their solicitude for the welfare of their offspring. Therefore they are then comparatively easy to approach. For this reason, if for no other, the bird student should strive to find the nesting sites. He should hunt for the nests of birds in winter, or very early in spring, while the trees are still leafless. Some birds use the old nests, others build again on the same bush or tree, or near it. A record of the old nests found will tell the searcher where to look for new ones in nesting time. By visiting such situations when birds are nesting one may see the birds carrying building material to their new nests.

A word of caution is necessary here, however. Those who have found and watched birds' nests often complain that something usually happens to the eggs or the young birds. I have learned by sad experience that a close and frequent examination of a bird's nest in the woods only serves to call the attention of the bird's enemies. There are creatures always on the watch for an opportunity to rob birds' nests. The fox sometimes follows a man-track. Perhaps he has learned that the path of man in the woods may lead to food. Too often the man-trail leads to wounded or dead birds and animals—a lunch that may reward the fox. Fish heads and other offal are thrown out around a camping place. So Reynard cunningly follows. Those who watch or photograph birds' nests on the ground run the risk of leading both fox and skunk to them. A friend who was photographing birds' nests found that they were being robbed by a fox which was actually seen following the trail. Those who closely examine the nests of birds in trees or shrubbery are likely to be watched unawares by the astute and cautious Crow, the thieving Jay, the mischievous Squirrel, or the blood-thirsty Weasel. I have seen both Jay and Squirrel following a man through the woods, keeping well hidden from his sight. If you approach a nest containing young, the cries of the parent birds may apprise all the wood folk of its location. Therefore, watch the birds with a glass, and do not go too close to the nest. Those who approach the nests of Herons or water birds that breed in colonies drive the old birds away, and thus expose the eggs and young to the attacks of Crows, for Crows are quick to seize such opportunities.

When watching a nest, approach it with caution, and observe it from such a distance that neither young nor old will be much disturbed by

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your presence. Many interesting habits may be seen in this way if a good glass be used.

How to Attract Birds

He who, unable to go far afield, waits and watches for birds in some secluded spot, or imitates their notes and so calls them to him, may learn more of their ways than will the most active pedestrian.

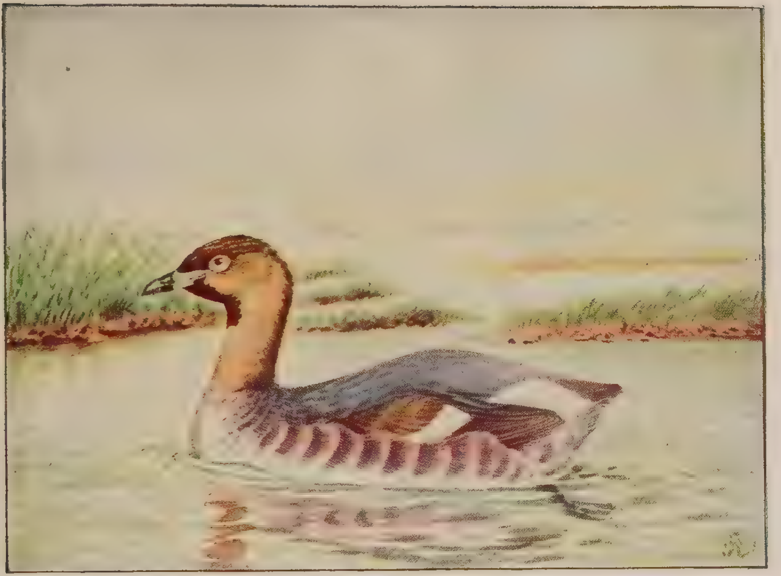
Luring Birds by Food

The country dweller may entice birds to the homestead by planting fruit-bearing trees, shrubs, vines, and other plants that will supply them with food. (See Vol. 5: "Gardening.") Even the urbanite possibly may attract a few Chickadees or Nuhatches in winter by putting out suet on trees; but other means are required to bring birds about the student in the field. You may facilitate your winter bird study by scattering millet seed or hayseed in suitable spots along your walks, or by hanging bones and suet in favorably situated trees, that you can visit now and then. In spring and fall small grain will attract Thrashers, Blackbirds, Bob-Whites, and Crows. Chestnuts and corn scattered about in the late fall or early winter will gather all the Blue Jays in the countryside.

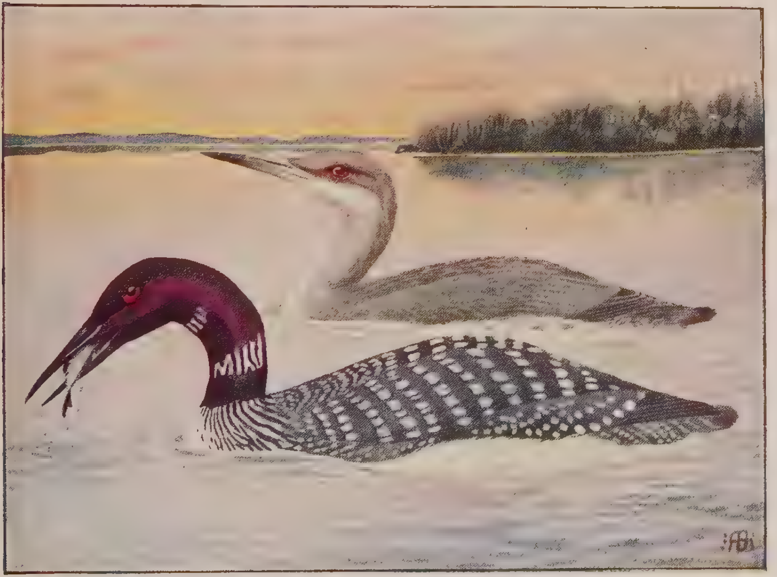
Imitating Birds' Notes

In summer, if the person be carefully concealed, some of the shyest birds may be brought near by mimicking their notes. Many bird notes may be imitated by the voice. Crows, Owls, some Herons, and some Ducks may be deceived in this manner. The Bob-White, Whip-poor-will, Red-shouldered Hawk, Baltimore Oriole, Bluebird, and others may be called by skillful whistling. The hunter has a call for Plovers and Sandpipers. He lures the Wild Turkey to its death by a call made of a wing-bone of one of its kind.

A sound which often is quite successful with the smaller birds is made by moistening the lips and sucking in the breath, with the back or side of the hand placed over the mouth. A certain call thus made will deceive the Blue Jay in summer or winter. When a Ruffed Grouse or Partridge with little chicks is discovered, you may keep the bird near you for some time by crouching and imitating her squeal or the thin whistle of her young chicks. In the breeding season most birds are deceived by an imitation (made on the back of the hand) of the scream of a young bird. By making this sound in a thicket near a Catbird's or Robin's nest, it is easy to alarm these birds so that their cries will bring within view most of the other birds in the neighborhood. This "screeping" sound will sometimes entice birds out of a thicket at other seasons of the year.

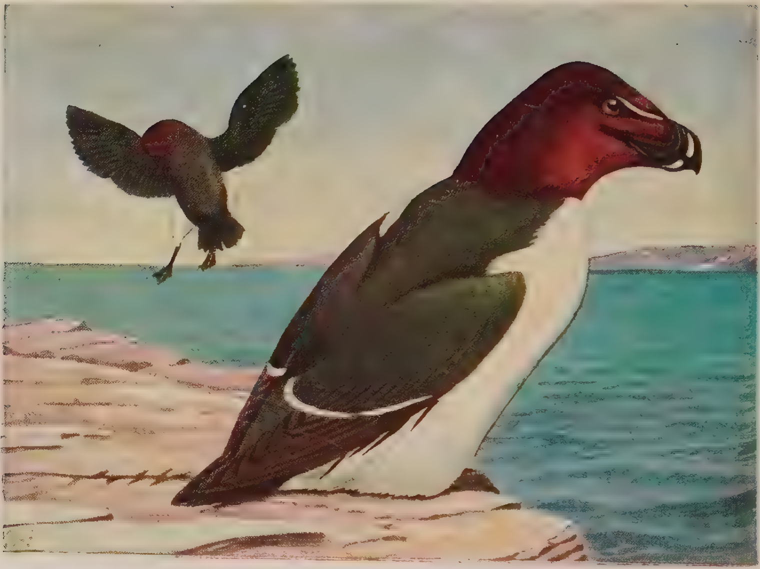


PIED-BILLED GREBE (1/6 nat. size)

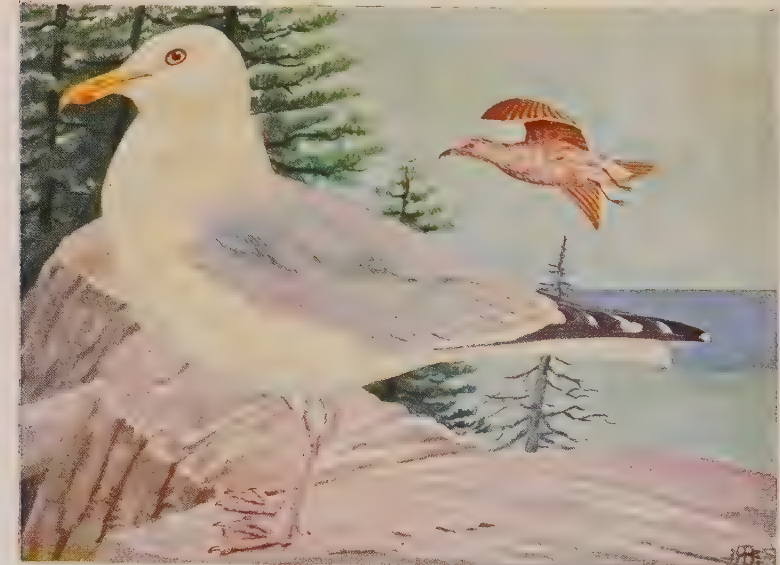


LOON (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER



RAZOR-BILLED AUK (1/6 nat. size)



HERRING GULL (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER

A Yellow-breasted Chat, thus called, almost alighted on my head. The Crested Flycatcher may be called in this way, even in the fall. Catbirds, Thrashers, Vireos, Thrushes, and Warblers all may be enticed by this call. If the observer is alone and well hidden, they will sometimes come within reach of his hand.

Utilizing the Curiosity of Birds

A captive Screech Owl in a tree will cause a gathering of most of the small birds of the neighborhood, whether in wood or orchard. Even a tame Crow, or tethered Cat, may attract some birds in nesting time. Many birds evince an acute curiosity. When collecting birds in my boyhood I stalked my first Sandhill Crane nearly a mile on an open prairie. We were out of provisions, and living on the country. Meat was a necessity; so when venison or wild Turkey was wanting we, perforce, must descend to roast Crane or baked Owl. The bird was first seen from the timber feeding in the slough. Waiting until it had lowered its head after glancing around, I made a short run through the prairie grass and dropped, to give the bird another chance to reconnoiter. Advancing thus "by rushes," I gained the edge of the slough unseen, being then within two hundred yards of the bird. I waded in. Just then the bird raised its head. I fell flat in the two or three inches of water, and the Crane flew off; but soon it swung its head to one side and looked back. Then, apparently, it began to wonder about the half-concealed thing lying there in the water. Slowly it swung round in a wide arc and came back, flying low, directly overhead. The thing in the water never moved until the Crane had passed. Soon afterward the Crane's skin changed owners, and a large slice off the bird's breast helped to fill a void that had held only two crackers that day. It was but another illustration of a theory of Darwin and Wallace—the survival of the fittest. Necessity knows no law but that of self-preservation. Still, if the ethics of the case are considered, no doubt the bird had the prior right to occupy that slough. Since then I have seen the Great White Heron, the Great Blue Heron, the Great White Egret, the Bald Eagle, and several species of wild fowl manifest their curiosity in a similar way.

It is difficult for most birds to understand the meaning of a silent human figure lying prone and half concealed. While so reclining I have been closely approached by Eagles and Vultures. It is said that the Fox sometimes will attract wild Ducks within leaping distance by allowing its tail and back to show a little as it plays about in the long grass on the shore. A concealed hunter sometimes will attract wild fowl toward the shore by waving a red rag on the end of a stick, or by using a small dog trained to gambol in the grass.

There are easier and pleasanter ways, however, of attracting the shy birds of the woods. "Nessmuk" says that there is an art which outflanks all wild animals—the art of sitting on a log. This sylvan necromancy consists of sitting absolutely still, and keeping both eyes and ears open. This will not generally succeed with wild fowl, except perhaps with the Mergansers, the Wood Duck, the Harlequin, and possibly a few others.

I once sat on a stone on the shore of the diminutive harbor of an island off the coast of British Columbia, and watched a flock of Harlequin Ducks swim around a little headland and come almost to my feet. Here the "Lords and Ladies," the handsomest of all Sea Ducks, played about for some time, showing off their plumage, throwing the sparkling drops from crest to wing; but at my first movement they beat the water into foam, sweeping away in a frenzy of affright.

Most River Ducks cannot be deceived in this way. They will fly at first sight of man, so the observer must be well concealed. But all wood birds, both shy and rare, may be outgeneraled by the quiet sitter. They seem to wonder what manner of thing this is that looks so like a man, but neither smokes nor swears, talks, laughs, nor tramps about. Slowly they draw near and peer at the curiosity, and finally they apparently conclude it to be harmless, and go about their usual avocations.

While I have been writing this in the Concord woods a bright Scarlet Tanager has sung and hopped about for ten minutes on some branches about fifteen feet away, on a level with my face. A Red-shouldered Hawk has alighted on a limb five feet from the ground and seven paces away; two Jays have chased a pair of Red Squirrels through the nearest tree; a Black-throated Green Warbler has come to a branch just above my head and peered into my face; a Black-billed Cuckoo has surveyed me from all sides. The other day a Sharp-shinned Hawk swept up the hill and alighted on a limb before my cabin. He scanned the ground, the trees, the bushes by the river shore; but every little terror-stricken songster crouched concealed. Then the Hawk caught the movement of my eyelid, sprang upon the air and swiftly glided downward and away, as noiselessly as he had come. Even the astute and wary Crow will forget in time his characteristic caution, and indulge his curiosity enough to alight near by and scan the intruder nervously.

The Watcher's Protection from Insects

There is one great drawback, however, to this method. In summer our woods are infested with mosquitoes, as well as with gnats and flies. A pair of light leather gloves, a net or veil of a mesh smaller than ordinary mosquito netting, to wear over the hat and head, and a light blanket or wrap that can be carried in a shawl strap, will enable one to keep quiet and yet defy the troublesome insects. A light camp-stool also is useful.

One who desires to camp in the summer woods will need a different outfit. For more than twenty years I have used a small "A" tent, made of olive-brown duck, with a flap to tuck under the blankets. It is seven feet long, four feet wide and three feet high. A small line is sewed along the top, which may be tied at each end to a tree or a stake to support the tent. Eight loops of heavy twine are staked down with forked sticks to hold out the sides. The ends are made of coarse cheesecloth, or fine netting, and the lower edges are provided with flaps to tuck under the blankets. A rubber blanket and a single light woolen one, with a cotton bag to be filled nightly with moss or grass for a pillow, complete the outfit, which may be rolled up and carried by a strap handle or "packed" above a knapsack. The birds soon become accustomed to this tent, and even will alight upon it. For several evenings it was the favorite perch of a Screech Owl. From it I have watched the shore birds and Seals on barren islands. In it I narrowly escaped being run over by two Deer. The Puma has circled around it, and once a Wildcat actually walked on it, stepping on my breast.

"Hides" and "Blinds"

From such a tent, or from a screen of netting you may watch the Ruffed Grouse, or Partridge, and her callow brood. You may camp by a heronry and see the old birds come and go and feed their young. I have camped on a small dry mud bank in a great swamp, with no other dry land for miles around, being entertained by the nightly concerts of mosquitoes, Ducks, Herons, Frogs, and Alligators, without the least discomfort or inconvenience.

There are shelters in which one may remain concealed, varying in construction from the log camp of the sportsman to the bough camp of the Indian or the "hide" or "blind" of the gunner. The umbrella blind used by bird photographers is an excellent device for watching birds if set up in the shade. In full sunlight on a hot day it is about as comfortable as a Turkish bath. If the birds to be watched are very wary, it is best to set up the blind and leave it for several hours or even a day, that they may become accustomed to it. The observer should be accompanied by one or more persons when he goes to conceal himself within it. When his companions leave, the birds' suspicions are allayed, and curiosity may impel them to a close approach. Wooden decoys used in connection with "blinds," and bird calls will enable an expert to lure most shore birds as near to him as they will come to the gunner. A skillfully constructed blind placed on or near a long sandbar or point of the shore, and a few lumps of mud or turf judiciously distributed on the point, may enable one to get a good view of the several species of wild fowl. Apparently the flying birds at a distance mistake the clods for some of their own number, and come on, intending to alight. The best decoys are living birds anchored so that they can swim about. Sometimes a single Grebe or Duck in a small pond will attract a flock of several species. Many game birds and water-fowl may be baited with grain; but this is a method for those owning estates where birds can be protected, and should not be attempted by any bird student who would assemble the birds thus only to leave them to the tender mercies of the pot-hunter.

Those who wish to lure the sea birds may have some success with Gulls by putting out fish or offal upon some beach or bar, near a blind; Gulls may be seen anywhere about the harbors of cities where they are not molested. They frequent all places where fish offal and garbage are thrown into the water. To attract the birds of the ocean, however, one must go several miles to sea, where, by throwing overboard cod livers, or some similar food, several species may be lured near the boat.

CLASSIFYING THE BIRDS

By JENNIE ELLIS BURDICK

ORNITHOLOGISTS have divided the birds of America into seventeen groups or orders. Each of these orders is divided into species. Sometimes the families are divided into smaller groupings called sub-families. The ornithologists have given to each of these groups a scientific name, made from Latin or Greek words which indicate the characteristics of the birds in the groups. The following list shows the relationship existing between these different groups, and the scientific name of each. The Roman numeral indicates the orders; the Arabic numeral, the family; and the letters, the sub-family.

I.—Diving Birds (*Pygopodes*)

These are the birds which are nearest like the reptiles. Their bodies are so formed, and their legs are so short, that it is almost impossible for them to walk on land. When they try to do so they generally push themselves along flat on the ground like a snake.

1. Grebes (*Colymbidæ*)
2. Loons (*Gaviidæ*)
3. Auks, Murres, and Puffins (*Alcidæ*)

II.—Long-Winged Swimmers (*Longipennes*)

These birds are generally seen on the wing over or near water.

1. Skuas and Jaegers (*Stercorariidæ*)
2. Gulls and Terns (*Laridæ*)
3. Skimmers (*Rynchopidæ*)

III.—Tube-Nosed Swimmers (*Tubinares*)

The birds of this order have nostrils which open through tubes.

1. Albatrosses (*Diomedeidæ*)
2. Fulmars, Shearwaters, and Petrels (*Procellariidæ*)

IV.—Totipalmate Swimmers (*Steganopodes*)

The birds grouped under this name have feet with webs between all (*toti*) the toes, making the foot like the palm of the hand (*palmate*).

1. Tropic Birds (*Phaëthontidæ*)
2. Gannets (*Sulidæ*)
3. Darters (*Anhingidæ*)
4. Cormorants (*Phalacrocoracidæ*)
5. Pelicans (*Pelecanidæ*)
6. Man-o'-war Birds (*Fregatidæ*)

V.—Lamellirostral Swimmers (*Anseres*)

These swimmers have grooves along the edges of their bills.

1. Ducks, Geese, and Swans (*Anatidæ*)
   - a. Mergansers (*Merginæ*)
   - b. River Ducks (*Anatinæ*)
   - c. Sea Ducks (*Fuligulinæ*)
   - d. Geese (*Anserinæ*)
   - e. Swans (*Cygninæ*)

VI.—Lamellirostral Waders (*Odontoglossæ*)

In the five orders above the birds have short legs. In this sixth order we have birds with bills and feet like those in the fish order, but with very long legs.

1. Flamingoes (*Phœnicopteridæ*)

VII.—Herons, Storks, Ibises (*Herodiones*)

Here are grouped the long-legged wading birds generally found along the shores or on muddy flats. They have no webs between their toes.

1. Spoonbills (*Plataleidæ*)
2. Ibises (*Ibididæ*)
3. Storks and Wood Ibises (*Ciconiidæ*)
4. Herons, Bitterns, and Egrets (*Ardeidæ*)

VIII.—Marsh-Dwellers (*Paludicolæ*)

Birds of this order always live in marshy places. They have four toes, arranged like those of a hen—the back one raised.

1. Cranes (*Gruidæ*)
2. Courlans (*Aramidæ*)
3. Rails, Gallinules, and Coots (*Rallidæ*)

IX.—Shore-Birds (*Limicolæ*)

Shore-birds are so named because they are almost always found in open places along streams of water and on the open beaches.

1. Phalaropes (*Phalaropodidæ*)
2. Avocets and Stilts (*Recurvirostridæ*)
3. Snipes and Sandpipers (*Scolopacidæ*)
4. Plovers (*Charadriidæ*)
5. Surf-birds and Turnstones (*Aphrizidæ*)
6. Oyster-catchers (*Hæmatopodidæ*)

X.—Hen-Like Birds (*Gallinæ*)

The birds of this order live on the ground—make their nests there and find almost all their food there. They are shaped like the common barn-yard fowls, and their habits are much the same.

1. Bob-Whites and Quails (*Odontophoridæ*)
2. Grouse, Spruce Partridges, and Ptarmigans (*Tetraonidæ*)
3. Turkeys (*Meleagridæ*)
4. Pheasants (*Phasianidæ*)

XI.—Pigeons and Doves (*Columbæ*)

In drinking, a pigeon immerses the bill to the nostril and draws in the water in a continuous draft. So far as any one knows, no other bird drinks in this manner.

1. Pigeons and Doves (*Columbidæ*)

XII.—BIRDS OF PREY (*Raptores*)

All the families found in this order have one general characteristic—that of feeding on other animals.

1. Vultures (*Cathartidæ*)
2. Hawks, Eagles, and Kites (*Buteonidæ*)
3. Falcons and Caracaras (*Falconidæ*)
4. Ospreys (*Pandionidæ*)
5. Barn Owls (*Aluconidæ*)
6. Horned Owls, etc. (*Strigidæ*)

XIII.—PARROT-LIKE BIRDS (*Psittaci*)

Hooked bills and yoked toes—two toes turned forward and two turned backward—are the tell tale marks of this order.

1. Parrots and Parrakeets (*Psittacidæ*)

XIV.—CUCKOOS, TROGONS, AND KINGFISHERS (*Coccyges*)

In this order are found three families of birds that have very little outward resemblance to each other. One man said it looked to him as if the wise men had these three families left over when they finished classifying the birds, and, not knowing what to do with them, bunched them in one order; but, of course, he had not examined their skeletons as the scientists had, and did not know that they were alike.

1. Cuckoos, Anis, and Roadrunners (*Cuculidæ*)
2. Trogans (*Trogonidæ*)
3. Kingfishers (*Alcedinidæ*)

XV.—WOODPECKERS (*Pici*)

These are the carpenters of Birdland.

1. Woodpeckers (*Picidæ*)

XVI.—LONG-HANDED BIRDS (*Macrochires*)

A bird's wing has three parts, just like the human arm and hand. In this order the birds have the hand part of the wing very long.

1. Goatsuckers (*Caprimulgidæ*)
2. Swifts (*Micropodidæ*)
3. Hummingbirds (*Trochilidæ*)

XVII.—PERCHING BIRDS (*Passeres*)

Last and not least but greatest of the orders is that of the Perching Birds. These birds usually have four toes which are so arranged that the bird can grasp a branch or some other perch. In this order bird-life reaches its highest development—the nervous system is acutely sensitive; the senses of hearing and sight are keenly developed; the circulation of the blood and the breathing are rapid; and the temperature of the body is the highest of the animals.

1. Tyrant Flycatchers (*Tyrannidæ*)
2. Larks (*Alaudidæ*)
3. Crows, Ravens, Jays, and Magpies (*Corvidæ*)
4. Starlings (*Sturnidæ*)
5. Blackbirds, Grackles, and Orioles (*Icteridæ*)
6. Finches (*Fringillidæ*)
7. Tanagers (*Tangaridæ*)
8. Swallows (*Hirundinidæ*)
9. Waxwings (*Bombycillidæ*)
10. Silky Flycatchers (*Ptilogonatidæ*)
11. Shrikes (*Laniidæ*)
12. Vireos (*Vireonidæ*)
13. Warblers (*Mniotiltidæ*)
14. Wagtails (*Motacillidæ*)
15. Dippers (*Cinclidæ*)
16. Thrashers, Mockingbirds, etc. (*Mimidæ*)
17. Wrens (*Troglodytidæ*)
18. Creepers (*Certhiidæ*)
19. Nuthatches (*Sittidæ*)
20. Titmice (*Paridæ*)
21. Wrens-Tits (*Chamæidæ*)
22. Kinglets and Gnatcatchers (*Sylviidæ*)
23. Thrushes, etc. (*Turdidæ*)

WATER AND LAND BIRDS EVERY ONE SHOULD KNOW

By T. GILBERT PEARSON

Pied-Billed Grebe

Podilymbus podiceps (*Linnæus*)

A. O. U. Number 6

Other Names.—Hell-diver; Devil-diver; Water-witch; Dabchick; American Dabchick; Piedbilled Dabchick; Dipper; Diedapper; Didapper; Divedapper; Carolina Grebe; Thick-billed Grebe.

General Description.—Length, 13 inches. Color above, brownish-black; below lighter brown and white. Bill, short and thick; no crests.

Nests and Eggs.—Nest: A floating structure of dead grass, reeds, mud, and vegetable matter, unattached or fastened to living rushes. Eggs: 6 to 9, white, sometimes tinged with greenish.

Distribution.—North and South America; breeds from British Columbia, southern Mackenzie, southern Keewatin, Quebec, and New Brunswick southward to Chile and Argentina; winters from Washington, Texas, Mississippi, and the Potomac valley southward.

Grebes are very queer birds, and are more like fish than birds, in that almost their entire lives are spent either in or on the water. You will never see one on land, and in fact it may be doubted whether one could walk if it should come on shore, its legs being placed so far back on its body. Even when the bird builds her nest she does not come to land, but makes one that floats on the water. It is constructed of rushes and decaying vegetation, and is prevented from floating away by the surrounding water plants. When she leaves it she carefully covers the eggs with portions of the nesting material, which, of course, hides them from the view of any crow that may fly over, or any man who might chance to paddle his canoe that way.

These birds inhabit still ponds and lakes, and the quiet, grassy backwaters of rivers. They are wonderful divers, and can swim for long distances under water. The "Hell-diver" is one name by which the bird is often called. The Grebe's food consists of leaches, water insects, and little fish. It has a series of odd cries, which seem but a natural part of this most unnatural bird.

Loon

Gavia immer (*Brünnich*)

A. O. U. Number 7

Other Names.—Common Loon; Big Loon; Great Northern Diver; Imber Diver; Hell-diver; Ember-Goose; Walloon; Ring-necked Loon; Black-billed Loon; Guinea Duck; Greenhead; Toadlie.

General Description.—Length, 28 to 36 inches. In summer: Upper parts, glossy black with white spots; under parts, white. In winter: Upper parts, grayish-brown without spots.

Nests and Eggs.—Nest: Usually a hollow in the sand, without nesting material; in some localities a rough nest is constructed of sticks and reeds; occasionally the top of an old muskrat house is utilized. Eggs: 2 dark olive-gray, stained with brown and spotted with black.

Distribution.—Northern part of northern hemisphere; in North America breeds from Alaska across Arctic North America to Greenland, south to northern California, across the United States at about the parallel 42° to Nova Scotia; winters from southern British Columbia, the Great Lakes, and southern New England to Lower California, the Gulf coast, and Florida.

The largest of all the Order of Diving Birds is the Loon. It is at least two and a half feet in length, and is heavy for its size. In summer it inhabits the lakes of the Northern States and Canada, and wherever found is well known to the people of the region. No bird of our northern country has such a wild, melancholy cry. Its loud dismal notes are most startling, and as they ring across the lake just before a storm the effect is weird in the extreme. The sounds suggest the shrieking laugh of some demented woman.

The Loon lays two olive-brown spotted eggs, usually in a nest built close by the water on some islet or lonely point of marsh. It is a wonderful swimmer, and captures its prey, which consists chiefly of fish, by diving and outswimming the fish beneath the surface. When driven to earth by storms during migration it is perfectly helpless. It cannot walk but crawls, and is wholly unable to take wing except from the water, along the surface of which it flaps for many rods before swinging in the air. These birds migrate north and south along the Atlantic coast by tens of thousands.

RAZOR-BILLED AUK

ALCA TORDA *Linnæus*

A. O. U. Number 32

OTHER NAMES.—Razor-bill; Tinker.

GENERAL DESCRIPTION.—Length, 18 inches. Color above, black; below, white. Bill, flatly compressed; tail pointed.

NESTS AND EGGS.—Usually one egg, sometimes two, laid on the bare rock or cliffs or islands along the coast, very variable in shape and size of markings; white or bluish, spotted and blotched with sepia or black, these spots sometimes wreathed in a circle around the large end; in others, diffused over entire surface.

DISTRIBUTION.—Coasts and islands of the north Atlantic; breeds on American side from southern Greenland to Newfoundland and New Brunswick; winters from New Brunswick and Ontario to Long Island, and rarely to North Carolina.

IF ONE wishes to find this queer-looking bird of the sea it will be necessary to sail to the north Atlantic. Along the rocky shores of islands from New Brunswick to Greenland the Razor-billed Auk makes his summer home. In the crevices and cracks of the cliffs, or among the huge bowlders piled along shore just above the waves, it hides its one or two heavily spotted eggs. These are large for the size of the bird, being three inches in length and nearly two inches wide. When the young have attained sufficient size they are conducted to the water, there to spend the most of their lives, except when they in turn come to the rocks to raise little Auks. It is said that if the young are slow about taking to the water the parents pick them up by the back of the neck and carry them down to the tumbling waves, which in their little hearts the baby birds have feared to face.

Auks are wonderful divers, and appear to secure their living chiefly by swimming beneath the surface to secure various forms of marine life. In winter they drift southward along the coast to regions where ice is not so abundant. At this season they are seen in the ocean as far south as Long Island, and a few have even been found off the North Carolina beaches.

HERRING GULL

LARUS ARGENTATUS *Pontoppidan*

A. O. U. Number 51

OTHER NAMES.—Common Gull; Harbor Gull; Sea Gull; Lake Gull; Winter Gull.

GENERAL DESCRIPTION.—Length, 24 inches. Color, pure white with grayish-blue mantle.

NESTS AND EGGS.—Nest: Sometimes on the ground, occasionally in trees; ground nests usually mere depressions with scant nesting material; tree nests bulky and well constructed of strongly interwoven grass and moss. Eggs: 3, light bluish or greenish-white to dark olive-brown, irregularly blotched, spotted, and scrawled with dark brown and black.

DISTRIBUTION.—Northern hemisphere; in America breeds from south-central Alaska, across British America to Cumberland Sound, south to British Columbia, across the United States on about the parrallel 43° to Maine, and in Europe south to northern France and east to White Sea; winters from northern border of United States southward to Lower California and western Mexico, and from Gulf of St. Lawrence and the Great Lakes south to the Bahamas, Cuba, Yucatan, and coast of Texas, and in Europe to Mediterranean and Caspian seas.

THE large Gulls so constantly seen along our coast and about the lakes and larger rivers are the Herring Gulls. The so-called "Gray Gull" that is usually with the white ones is not a different species, but merely is the young Herring Gull of the year. As the Gulls fly about they are looking for pieces of food thrown into the water, or for dead fish floating on the surface or washed ashore. Sometimes they eat clams, and in order to break the shells they carry them high in the air and drop them on the hard beach.

The Herring Gulls build their nests on islands in the northern lakes, and on lonely islands along the coast from Massachusetts northward. About 200,000 raise their young every summer on the rocky islands in the Atlantic Ocean off the coast of Maine. They are found as far north and west as Alaska. Often the nests are very strong structures of twigs and grasses. As a rule, these are placed on the ground, but in places where the birds have been much disturbed by enemies, or when the ground of the island becomes much crowded with nests, some of them will make their large cradles in trees, from ten to thirty feet from the ground.

LAUGHING GULL

LARUS ATRICILLA *Linnæus*

A. O. U. Number 58

OTHER NAME.—Black-headed Gull.

GENERAL DESCRIPTION.—Length, 16 inches. Color, white with dark slate-gray mantle and almost black hood.

NEST AND EGGS.—Nest: On the ground in marshes; constructed of seaweed, sedges, and eelgrass. Eggs: 2 to 5, from dull grayish to dark olive, heavily marked with spots and splashes of brown, black, chestnut, and lavender.

DISTRIBUTION.—Tropical and temperate coasts of North America; breeds from Maine (rarely) and Massachusetts (abundantly but local) south on the Atlantic and Gulf coasts to Texas, the Lesser Antilles, and Venezuela; winters from Georgia and Gulf coast south to western Mexico, Chile, and Brazil; casual in Colorado, Nebraska, Wisconsin, Ontario, and Iowa.

UNLIKE most of the Gulls in the United States, the Laughing, or Black-headed, Gull is rarely if ever seen about fresh water. It is distinctly a bird of the sea coast. Its loud, rapidly repeated notes of "ha, ha, ha, ha!" suggest human laughter, from which fact it acquired its name. In the months of May, June, and July these Gulls come together in colonies to build their nests and rear their young. On the coast of Maine the nests are built on the ground in high grass.

Courtesy of Outing Publishing Co.

LAUGHING GULLS

FROM A PHOTOGRAPH BY H. K. JOB

From New Jersey southward to Florida they usually select salt marshes, generally those connected with islands. If from the "crow's nest" of a vessel one should look out over a marsh inhabited by Laughing Gulls, the sitting birds would appear as numerous white spots scattered over the brown expanse of salt grass.

The nests of grass and sea-weeds are placed well above the reach of high tides. One enemy of these little Gulls is the Fish Crow. This nest-robber is ever on the lookout for unguarded eggs, and sticking his bill through them carries them away one at a time. Laughing Gulls were killed so extensively for their feathers some years ago that their numbers have been greatly reduced.

COMMON TERN

STERNA HIRUNDO *Linnæus*

A. O. U. Number 70

OTHER NAMES.—Sea Swallow; Wilson's Tern; Summer Gull; Mackerel Gull; Lake Erie Gull; Bass-gull; Red-shank; High Diver.

GENERAL DESCRIPTION.—Length, 15 inches. Color, white with mantle of pale pearl-blue.

NEST AND EGGS.—Nest: A hollow in the sand; composed of a few bits of grass and dry seaweed. Eggs: 3, greenish-white to deep brown, spotted and blotched with brown, black, and lavender.

DISTRIBUTION.—Northern hemisphere, northern South America, and Africa; breeds from Great Slave Lake, central Keewatin, and southern Ungava south to southwestern Saskatchewan, northern North Dakota, southern Wisconsin, northern Ohio and North Carolina; winters from Florida southward to Brazil; casual in migration on Pacific coast from British Columbia to Lower California. In eastern hemisphere, breeds in Europe and Asia and winters in India and Africa.

ON NUMEROUS rocky islands along the Atlantic coast from Long Island to Maine, the Wilson's, or Common, Terns gather in large numbers each summer.

On many sandy islands from Long Island to Florida the same great assembling of Terns takes place. It is indeed an experience to visit one of these places, where on an area not exceeding an acre or two in extent perhaps three thousand Terns have their nests and young. Alarmed by your near approach, they rise from the ground, and with cries of alarm and savage resentment circle and swoop through the air above your head. There is one swish after another as the bolder members of the throng strike down within a few feet of your head.

The three or four heavily spotted eggs are laid in a very slight nest on the ground, and so thickly are the nests clustered that it is often difficult to walk without stepping on one of them. Crabs at times kill the young just as they are emerging from their shells. Sometimes thoughtless people leave cats on the sea-bird islands, and in some cases these abandoned pets have nearly exterminated colonies of Terns by catching and eating both the young and old birds. Terns feed largely on small fish which exist in the ocean by myriads, and which serve as food for so many of the feathered wanderers by the sea.

LEACH'S PETREL

OCEANODROMA LEUCORHOA (*Vieillot*)

A. O. U. Number 106

OTHER NAMES.—Common Fork-tailed Petrel; Leach's Fork-tailed Petrel; White-rumped Petrel.

GENERAL DESCRIPTION.—Length, 8 inches. Color, brownish-black. Legs, short; tail, forked, outer feathers more than ½ inch longer than middle pair.

NEST AND EGGS.—Nest: In burrows on the ground. Eggs: Single, white, unmarked, or wreathed with fine light red spots around the larger end.

DISTRIBUTION.—Both coasts of North America; breeds from the Aleutian and Copper islands, Bering Sea, south to Sitka, and from southern Greenland south to Maine and the Hebrides; casual in migration south to Virginia.

MANY species of Petrels are found on the oceans of the world. In general they are known to sea-going folks as "Stormy Petrels" and "Mother Cary's Chickens." From their habit of flying low over the waves with feet hanging down as though walking, they were named Petrels, for Peter of old, who is said to have walked on the water.

The only member of this family to nest on the Atlantic coast of North America is the Leach's Petrel. On many islands off the rocky coast of Maine, and northward, they assemble from early May until September, for their nesting duties. In the soft ground little burrows are dug about a foot and a half in length. The entrance is often under some old root, or even a stick lying on the ground, and the end is only a few inches beneath the surface. One white egg is laid which possesses the musty odor so peculiar to this bird.

About the nests the birds are nocturnal. The traveler may visit a small island, where hundreds of them are nesting, and never suspect that even one Petrel is present. They become active at dark, and the night air is soon filled with their curious little crooning cries. These notes are exchanged between the bird guarding the eggs and its mate, that perhaps has been flying all day about the ocean.

DOUBLE-CRESTED CORMORANT

PHALACROCORAX AURITUS AURITUS (*Lesson*)

A. O. U. Number 120

OTHER NAMES.—Crow Duck; Shag; Water-Turkey; Lawyer; Nigger Goose.

GENERAL DESCRIPTION.—Length, 33 inches. Prevailing color, greenish-black. *Throat sac, convex behind.*

NEST AND EGGS.—Nest: On the ground; constructed of twigs and weeds; sometimes on ledges of sea islands where built of fresh seaweed and kelp. Eggs: 2 to 4, bluish-green with white chalky incrustation.

DISTRIBUTION.—Eastern North America; breeds from central Saskatchewan, southern Keewatin, northeastern Quebec and Newfoundland south to northern Utah, South

Dakota, southern Minnesota, and Penobscot Bay, Maine. Winters from North Carolina (casually Massachusetts) south to the Gulf coast; casual in Bermuda.

THERE are about forty species of Cormorants scattered over the world. They are large black or dark-brown birds and live about lakes, rivers, and along the sea-coast. They feed on fish that they procure by pursuing them under water and capturing them with their sharply hooked beaks.

In China, Cormorants are tamed and trained to bring the fish they catch to the boat of their owner.

The Double-crested Cormorant is found in summer from Maine northward, where they lay their three or four white eggs in nests on rocky cliffs. From North Carolina southward is found the Florida Cormorant, which closely resembles the Double-crested. These birds build their nests in trees. About one hundred and fifty pairs of them have nested in a small clump of cypress trees in Great Lake, North Carolina, for many years. Here they capture and feed to their young great numbers of small eels. The nests are strong, heavy affairs, and as twenty or thirty will sometimes be built in one tree, it is easy to see them at a considerable distance. The young at first are naked and look like awkward black rubber birds. In a few days, however, they become covered with a soft velvety coating of down, which they wear until the feathers appear. A common name for the Cormorant is "Nigger Goose."

BROWN PELICAN

PELECANUS OCCIDENTALIS *Linnæus*

A. O. U. Number 126

OTHER NAME.—Common Pelican (of Florida).

GENERAL DESCRIPTION.—Length, 4¼ feet; spread of wings, 6½ feet. General color, brown, darker above. Bill with pouch hanging from under side.

NEST AND EGGS.—Nest: In rookeries, on shores or marshy islands, usually on the ground or sometimes in low mangrove bushes; constructed of sticks, coarse grass, and weed stalks and lined with finer grasses. Eggs: 2 to 3, chalky-white.

DISTRIBUTION.—Gulf coast of United States and Atlantic coast of United States and Atlantic coast of Central and South America; breeds from Florida and Louisiana south to Brazil; rare in North Carolina; accidental in Wyoming, Nebraska, Iowa, Illinios, Indiana, Massachusetts, and Nova Scotia. Replaced on the Pacific Coast by a close relative, the California Brown Pelican.

THE largest bird found commonly along our southern coasts is the Brown Pelican. It is four or more feet in length and has a bill a foot long. When the Pelican goes fishing it flies along over the ocean until it sees a fish it wants, and then turning down suddenly it plunges head first into the water and seizes its prey in its great pouch. Although they eat large quantities of fish, careful study has shown that they take very few of the kinds that are eaten by mankind. About some of the southern towns that are situated on the sea-coast these great birds become very tame, and will perch on wharves, or on boats riding at anchor in the harbor. They are always eager for fish-heads or other food thrown to them.

Brown Pelicans come together in large numbers to lay their white eggs and raise their young on small islands. There are thirty of these Pelican cities along the South Atlantic and Gulf coasts, between South Carolina and Mexico, and the combined population in the summer of 1918 was about 70,000. Many others are found along the California coast. The young are noisy when in the nest, but when grown they become absolutely silent and appear to have no voice.

Courtesy of the National Association of Audubon Societies

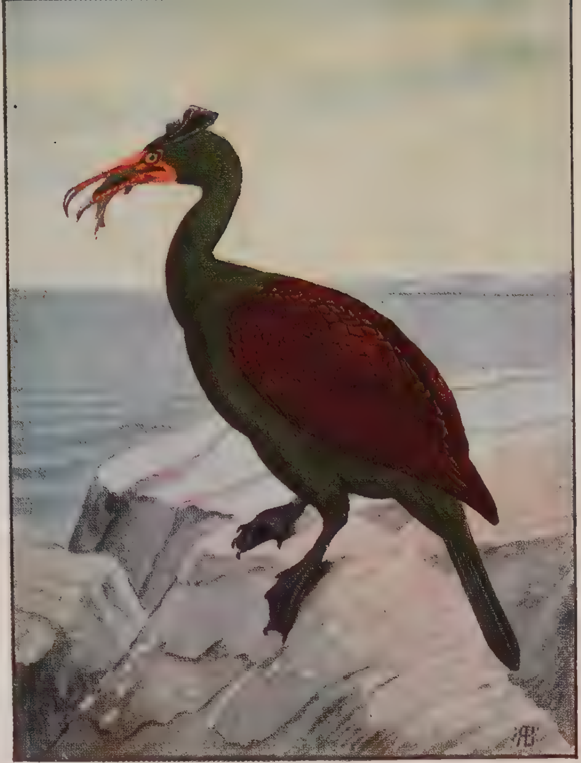
BROWN PELICANS ON EAST TIMBALIER RESERVATION, LOUISIANA
FROM A PHOTOGRAPH BY H. K. JOB

MALLARD DUCK

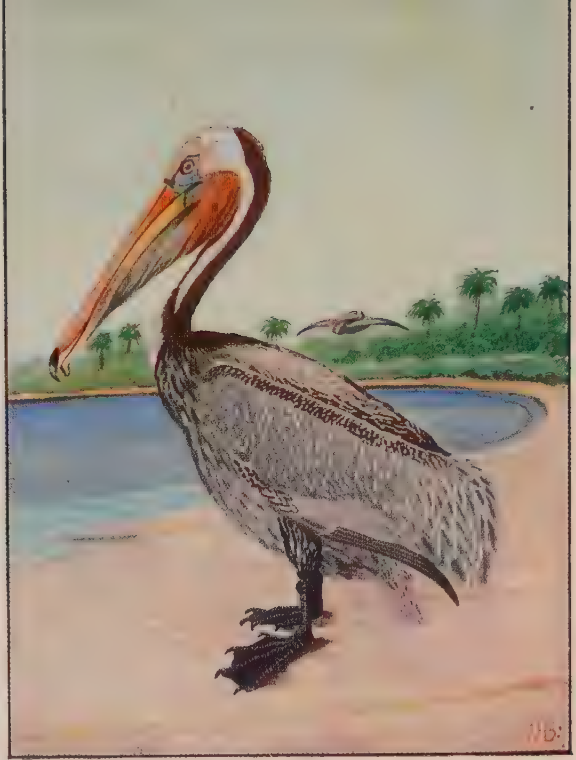
ANAS PLATYRHYNCHOS *Linnæus*

A. O. U. Number 132

OTHER NAMES.—Common Wild Duck; Stock Duck; English Duck; French Duck; Irish Mallard; Green-head (male); Gray Duck (female); Gray Mallard (female).

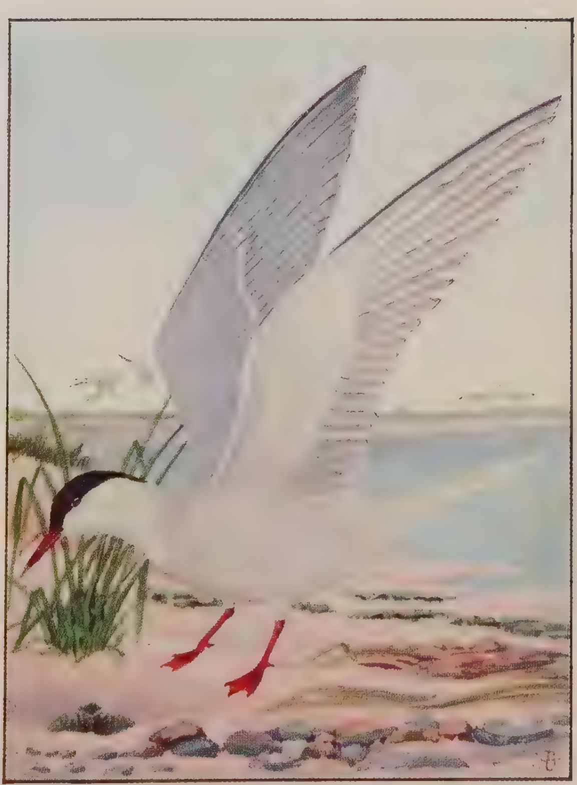


DOUBLE-CRESTED CORMORANT (1/6 nat. size)

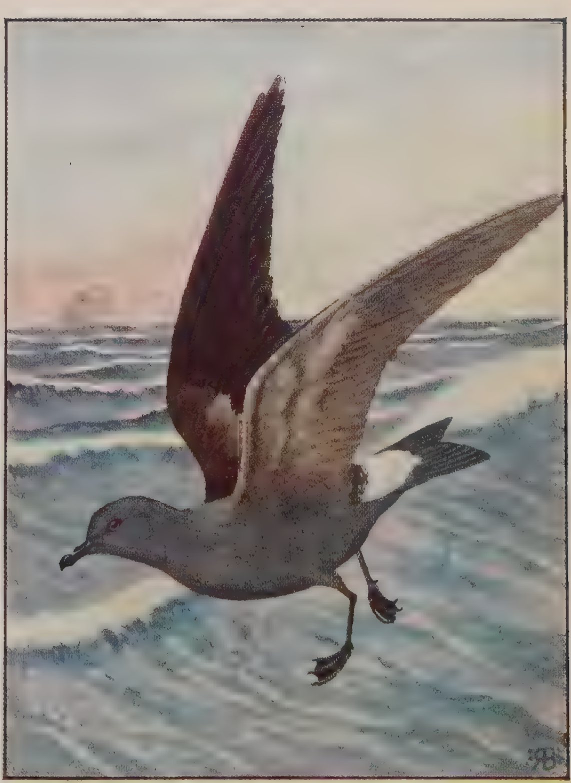


BROWN PELICAN (1/12 nat. size)

FROM DRAWINGS BY R. I. BRASHER



WILSON'S TERN (1/5 nat. size)



LEACH'S PETREL (1/3 nat. size)

FROM DRAWINGS BY R. I. BRASHER

General Description.—Length, 22 to 24 inches. Color of male: head, green; back, grayish-brown; under parts, gray with purplish-chestnut breast. Color of female: dusky-brown, and tawn, variegated and lighter below than above.

Nests and Eggs.—Nest: On the ground in a tussock of grass or weeds; built of fine reeds, grass, or leaves; well lined with down. Eggs: 6 to 10, pale olive or buffy-green.

Distribution.—Northern hemisphere; in North America breeds from Pribilof Islands and northwestern Alaska across British America to Greenland, south to Lower California and across the United States on about the parallel of 37°; winters from Aleutian Islands, Montana, Wyoming, Nebraska, southern Wisconsin, Ohio, Maryland, and Nova Scotia (rarely) south to Mexico, the Lesser Antilles, and Panama; casual in Bermuda and Hawaii.

The Mallard is one of the best known of all the forty-three kinds of wild Ducks found in North America. Its flesh is much esteemed as food, so every autumn when the great flocks begin to go south from their breeding grounds in the north there are many hunters waiting to shoot them. "Green-head" is one of their popular names, doubtless because the head of the male bird is bright green. Mallards do not belong to any group of song birds, and you would hardly expect a Duck to sing anyway. However, they can quack, and often do so to such an astonishing extent that it would seem that they were trying to sing in the Duck language.

When a mother Mallard gets ready to lay her eggs she scratches a slight hollow in the prairie, sometimes quite a distance from the water, and lines it with the soft downy feathers she picks from her own breast. In this warm bed she lays her ten or twelve light grayish eggs. When sitting on these she will allow one almost to step on her at times before taking wing. Most surely she must know that the color of her back blends with the color of the surrounding grass so perfectly that she is in little danger of being seen by any enemy that may chance to pass near. Many of our tame ducks are descendants from the wild Mallard Duck.

Eider Duck

Somateria dresseri *Sharpe*

A. O. U. Number 160

Other Names.—American Eider; Common Eider; Eider Duck; Dresser's Eider; Drake (male); Sea Duck (female); Black and White Coot (male); Isle of Shoals Duck; Squam Duck; Wamp; Canvas-back.

Description.—Length, 24 inches. Males are white above, and black below; females are pale rufous-brown, variegated with darker. This Eider differs from the Northern Eider in shape of bill; in latter base of bill extends along each side of forehead between the narrow pointed extension of crown feathers, this lateral extension being very narrow and ending in a point, whereas in the Eider the processes are more than twice as broad with obtuse rounded ends; the sides of head are more extensively greenish but otherwise coloration is similar.

Nests and Eggs.—Nest: On ground, in grass, in crevices between rocks, or in any sheltered locality; made of moss, seaweed, and lichens and lined with gray down from breast of the bird, the lining being added gradually during the month of incubation. Eggs: 6 to 10, usually 6, plain dull greenish-drab.

Distribution.—Northeastern North America; breeds from southern Ungava and Newfoundland, on the southern half of Hudson Bay to southeastern Maine; winters from Newfoundland and Gulf of St. Lawrence south on Atlantic coast to Massachusetts, rarely to Virginia, and in interior rarely to Colorado, Iowa, Wisconsin, Ohio, and western New York.

Three species of Eider Ducks are found along the northern parts of our Atlantic coast. They are all large Ducks and the males have very handsomely colored heads. "Eider down" is chiefly collected by taking from the nests the soft feathers which surround and often cover them. These have been plucked by the old birds from their breasts and bellies.

In parts of Greenland and Iceland the gathering of eider down for the market is an industry of some importance. In summer the American Eiders are found in small numbers along the coast of Maine. On the little rocky islands they come ashore to make their nests. The Audubon Society has hired wardens to protect them, and in 1919 the birds numbered about two hundred. The nests are hidden among the rocks, and are protected from view by clusters of grass weeds or bushes. Usually about six eggs are laid. These are pale green in color. Unless they are carefully guarded, fishermen and lobstermen will often land on the islands and take the eggs for food.

Eiders feed chiefly on mussels that grow on the rocks or sunken ledges in the sea. To get them they have to dive often to considerable depth Except when engaged in nesting, Eiders are usually found well out to sea.

CANADA GOOSE

BRANTA CANADENSIS CANADENSIS (*Linnæus*)

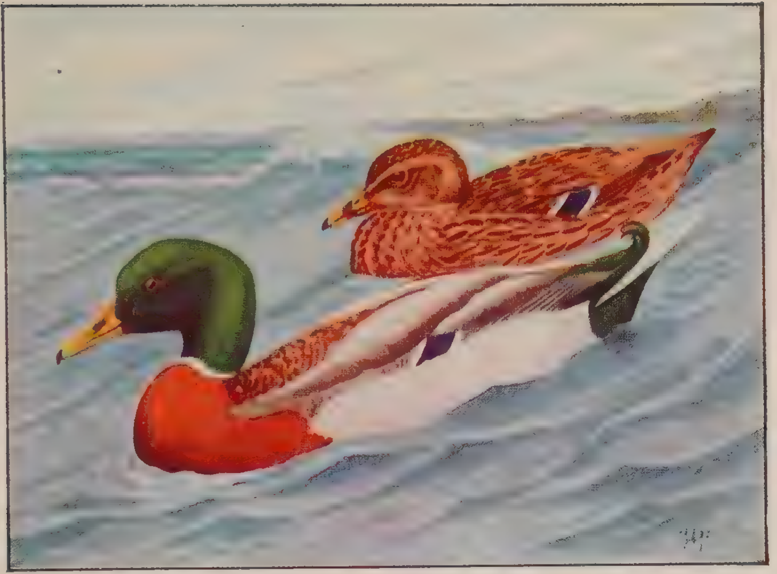
A. O. U. Number 172

Other Names.—Wild Goose; Common Wild Goose; Cravat Goose; Big Gray Goose; Bay Goose; Reef Goose; Black-headed Goose; Canada Brant; Honker; Long-necked Goose; French Goose; Ring-neck.

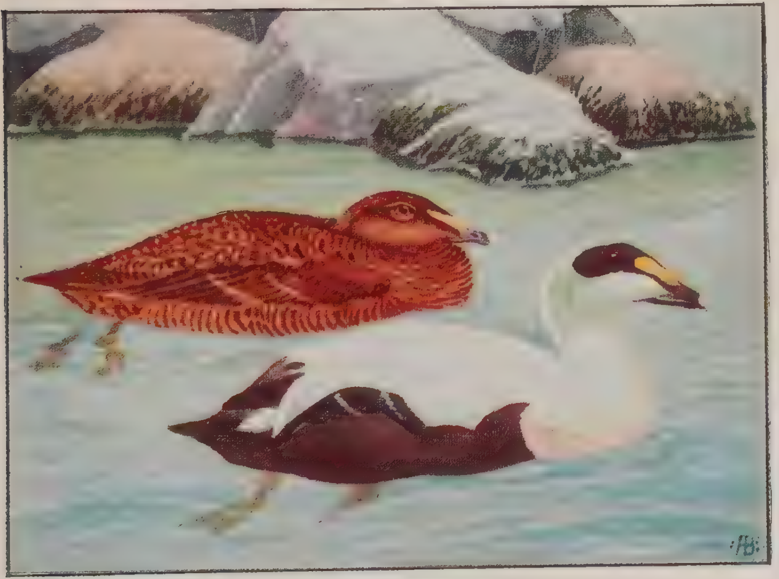
General Description.—Length, 35 to 43 inches. Head, black; body brownish-gray. Neck, long and slender.

Nest and Eggs.—Nest: Usually on a mound in marshes; constructed of grass, reeds, and leaves and lined with down; rarely old nests of Hawks or Eagles are appropriated. Eggs: 6 to 7, dull white.

Distribution.—North America; breeds from limit of trees in valley of the lower Yukon, northwestern Mackenzie, and central Keewatin south to southern Oregon, northern Colorado, Nebraska, and Indiana; formerly bred casually south to New Mexico, Kansas, Tennessee, and Massachusetts; winters from southern British Columbia, southern Colorado, southern Wisconsin, southern Illinois, and New Jersey (rarely southern Ontario and Newfoundland) south to southern California, Texas, and Florida, accidental in Bermuda and Jamaica.

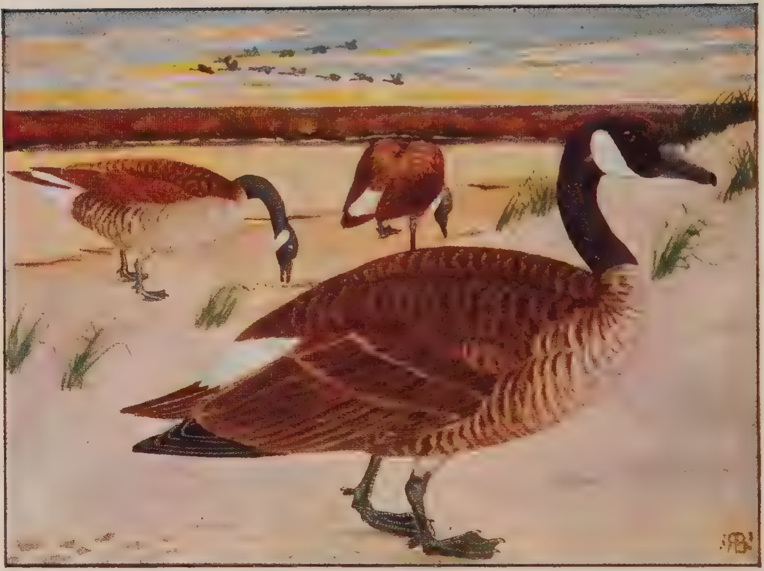


MALLARD DUCK (1/6 nat. size)

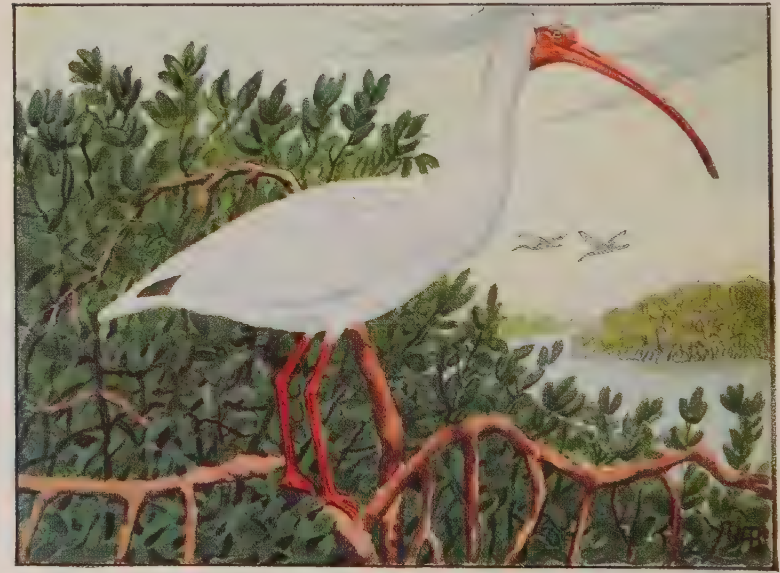


EIDER DUCK (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER

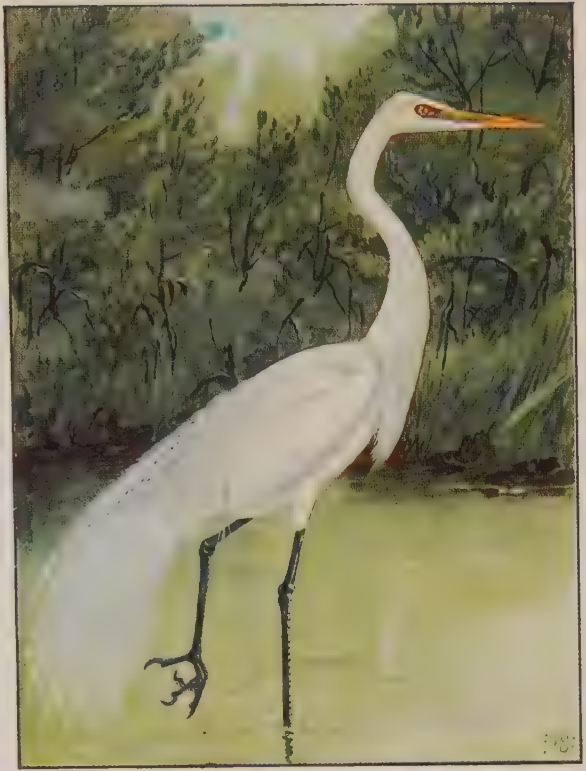


CANADA GOOSE (1/12 nat. size)

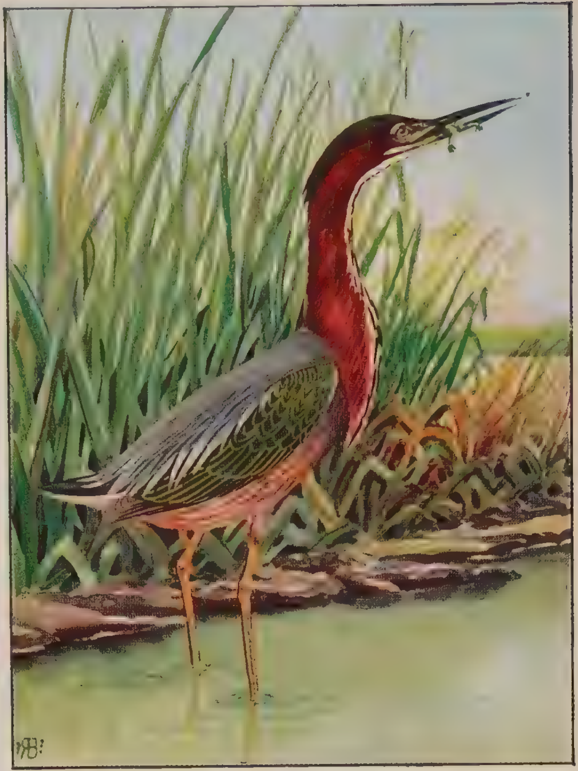


WHITE IBIS (1/8 nat. size)

FROM DRAWINGS BY R. I. BRASHER

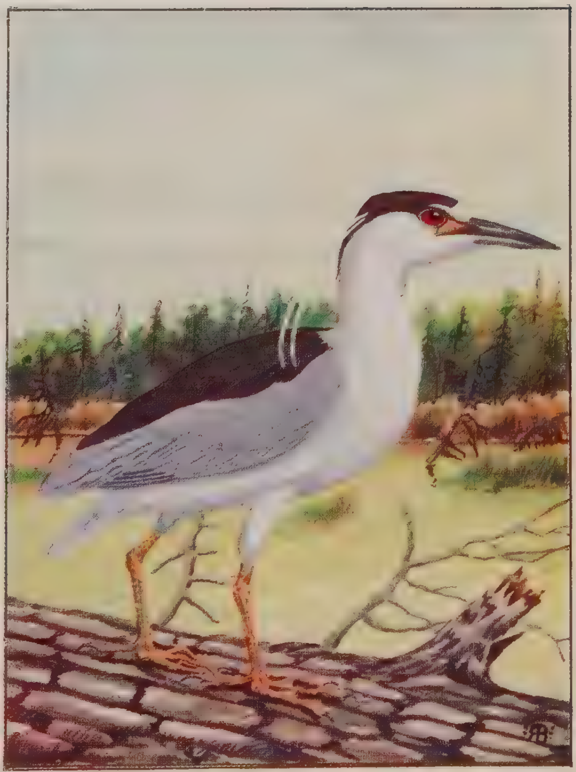


EGRET (1/12 nat. size)

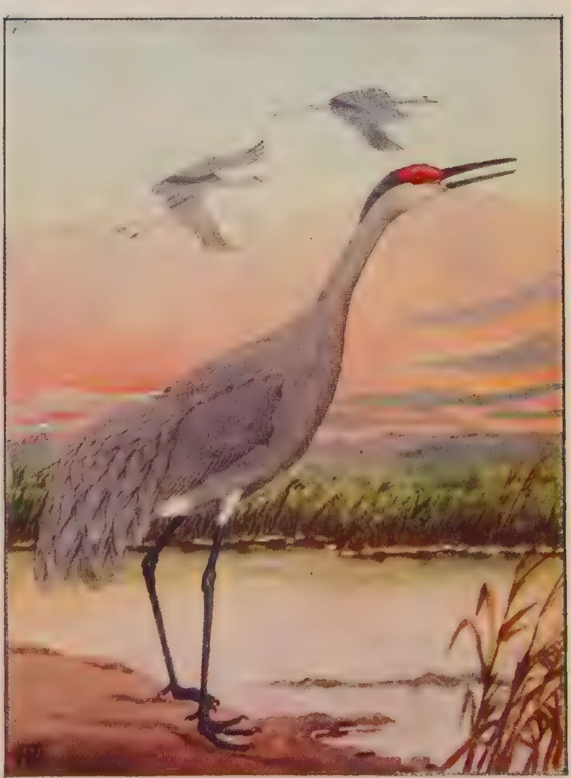


GREEN HERON (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER



BLACK-CROWNED NIGHT HERON (1/6 nat. size)



SANDHILL CRANE (1/12 nat. size)

FROM DRAWINGS BY R. I. BRASHER

From the end of its bill to the tip of its tail a well-grown Canada Goose measures four feet, which means that this is quite a large bird. When a flock of Robins flies over a town a thousand feet from the earth no one notices them, but when on a still morning a V-shaped flock of wild Geese goes over, their trumpeting "honks" are sure to cause many eyes to turn skyward. If this be in autumn, the great birds may be bound southward for their feeding grounds along the coasts of the Carolinas or the marshes of far distant Louisiana. If the time be early spring, then surely the big fellows and their mates are headed for their nesting grounds, perhaps in Minnesota, or maybe the tundra country that lies along the Arctic Circle.

Many gunners seek to shoot the Canada Geese while they are with us, but the birds are very wise, and few are killed. Their nests are found at various places in the great northwest. They are placed on the ground, and like wild Ducks' nests, are lined with downy feathers. While caring for their young, old Geese are unable to fly, for it is at that season that they molt their large wing-feathers.

White Ibis

Guara alba (*Linnæus*)

A. O. U. Number 184

Other Names.—Spanish Curlew, Stone Curlew (young); White Curlew.

General Description.—Length, 26 inches. Plumage, pure white, with tips of several outer wing-feathers black.

Nests and Eggs.—Nest: Usually in mangrove thicket; constructed from twigs of those bushes. Eggs: 3 to 5, grayish-blue or whitish, blotched and spotted with dull yellow, rufous and umber-brown.

Distribution.—North and South America, from Lower California, Texas, and South Carolina south to West Indies, Brazil, and Peru, and casually to Great Salt Lake, South Dakota, Illinois, Vermont, Connecticut, and Long Island; winters from Gulf of Mexico southward.

This is one of the wading birds of the southern marsh lands. They are generally found in flocks of from eight to ten to several hundred. In searching for crawfish and water insects they wade about in the shallow water, and probe along the bottom with their long curved bills. It is a beautiful sight to watch a flock of them on the wing. The feathers are pure white, with the exception of the black on the tip of the wings; and in flying they proceed by alternately sailing and flapping their wings.

White Ibises come together by hundreds, or even by thousands, at some favorite nesting place in the spring. Here as a rule they are associated with a variety of Herons that have assembled for a like purpose. Such a place makes indeed a "City of the Longlegs" In the rude but substantial nests of sticks, usually placed in trees or bushes over water, the four or five chocolate-spotted eggs are laid. The young have much brown in their plumage, and do not acquire the coat of white feathers until at least two years of age.

EGRET

HERODIAS EGRETTA (*Gmelin*)

A. O. U. Number 196

OTHER NAMES.—American Egret; White Heron; White Egret; Great Egret; Great White Egret; Great White Heron; Long White; White Crane.

DESCRIPTION.—Length, 41 inches. No crest, but a magnificent train of long plumes springing from back and extending beyond tail in breeding season; *plumage entirely white;* bill, yellow; legs and feet, black; lores and iris, yellow.

NEST AND EGGS.—Nest: Merely a platform of sticks in mangroves or in trees. Eggs: 3 to 5, plain bluish-green.

DISTRIBUTION.—Temperate and tropical America; breeds in Oregon and California, and from North Carolina, Flordia, the Gulf Coast, and Mexico south to Patagonia; formerly bred north to New Jersey and Wisconsin; winters from the Gulf of Mexico southward; casual in Manitoba, Quebec, New England, and Nova Scotia.

THE Egret is a bird whose plumage is of the purest white. It has a long neck and long legs like a Crane, and lives in the swamps and marshes of the South. As it wades about in the shallow water it finds many good things to eat. Here is a list of some of them: snakes, frogs, fish, and a great variety of water insects. When spring comes the Egrets over a large area of country come together in some deep cypress, or buttonwood, or willow swamp, and build their nests in the trees high above the water. From three to five blue eggs are laid, which in time hatch out baby Egrets, if trouble does not come their way.

In the nesting season Egrets grow on their backs a cluster of about fifty beautiful long white plumes called "aigrettes." Many fashionable women will pay high prices for these plumes to wear in their hats. As a result, the Egrets in the United States have nearly all been killed for their plumes. The feathers from one bird are worth twenty-five or thirty dollars. The Audubon Society has been able to get laws passed against killing these birds, and every year the society hires men to live in the swamps to protect from hunters the few remaining colonies of nesting Egrets now found in our Southland.

GREEN HERON

BUTORIDES VIRESCENS VIRESCENS (*Linnæus*)

A. O. U. Number 201

OTHER NAMES.—Little Green Heron; Green Bittern; Fly-up-the-creek.

GENERAL DESCRIPTION.—Length, 18 inches. Color above, dark green; below, dark brown.

Nest and Eggs.—Nests: Frequently in the woods but usually near water; a frail platform of twigs in a tree or bush. Eggs: 3 to 6, pale greenish.

Distribution.—Eastern North America; breeds from southern South Dakota, northern Wisconsin, southern Ontario, southern Quebec, and Nova Scotia south to the West Indies; winters from the West Indies southward, and rarely in southeastern United States; casual in Colorado.

Streams and millponds with wooded shores are the favorite haunts of the Little Green Heron. In the shallow water along the margins they watch for their prey, sometimes from a low overhanging branch, but more often as they wade cautiously about on their stilt-like legs. Startle one and with a sharp cry of "*Scow, scow!*" it will fly to a place of safety, where with raised neck feathers and jerking tail it watches for a short time your nearer approach.

The eggs are laid in a nest which for looseness of construction is not equaled by many other birds. Often you can count the eggs through the nest from below. Green Herons do not feed in flocks like many other Herons, but sometimes assemble in little communities of from six to a dozen pairs, when egg-laying time comes. The nests may be found in trees or bushes near water, or even over it; and again a nesting colony will be discovered in an apple orchard well away from any open water. They fly about at night from place to place, perhaps as much as in the daytime, and their hoarse calls when passing overhead are known to most boys who live in the country. Green Herons go south of the United States to pass the winter months.

Black-Crowned Night Heron

Nycticorax nycticorax nævius (*Boddaert*)

A. O. U. Number 202

Other Names.—Night Heron; American Night Heron; Qua-bird; Quawk; Squawk; Gardenian Heron.

General Description.—Length, 26 inches. Color above, black and ashy-gray; below, white. Head crested and, in breeding plumage, with a few long white cord-like plumes from back of crown.

Nest and Eggs.—Nest: In trees, bushes, or on ground; a large but loosely constructed affair of branches and twigs. Eggs: 3 to 6, pale seagreen.

Distribution.—North and South America; breeds from northern Oregon, southern Wyoming, southern Manitoba, northern Quebec, and Nova Scotia south to Patagonia winters from northern California and Gulf States southward; casual in winter north to Massachusetts and southern Illinois.

The common name for this bird is "Quawk." It is called this by many people because of its cry, the sound of which suggests this word. As the book name implies, it is a bird of the night. It is seldom seen abroad in the daytime, except during the nesting season, when it appears to be necessary for it to hunt both day and night to secure food for its ever-clamoring young.

Night Herons nest in colonies, sometimes with other species of Herons, but more often perhaps by themselves. Several hundred pairs frequently are found breeding together in some swamp or other secluded spot. Their coarse nests of sticks which support the four or five pale blue eggs are built on the limbs high up from the ground. In the Western States the birds often make their nests in tall rushes about the margins of lakes.

Along the coast Night Herons are fond of coming to the sand-bars and mud-flats exposed to low tide. Here they capture marine worms, stranded fish and other life that abounds in such situations. Sometimes one will catch an eel, and its companions will chase it through the air, trying to take from it the coveted prize.

SANDHILL CRANE

GRUS MEXICANA (*Müller*)

A. O. U. Number 206

OTHER NAMES.—Brown Crane; Upland Crane; Field Crane; Southern Sandhill Crane.

GENERAL DESCRIPTION.—Length, 4 feet; spread of wings, 6½ feet. Plumage, slaty-gray. Head *with bare spot forking behind*, not reaching on sides below eyes, and thinly sprinkled with hair.

NESTS AND EGGS.— Nest: On the ground, usually on a slight knoll or open grassy flats; generally a mere depression in the ground, lined with dry grass and weed stems. Eggs: 2, from pale olive to buffy-brown, marked over entire surface with spots of burnt-umber.

DISTRIBUTION.—North America; resident in Louisiana and Florida; bred formerly from southern British Columbia, Saskatchewan, Manitoba, and western Ontario south to California, Colorado, Nebraska, Illinois, and Ohio; formerly in migration east to New England; now rare east of the Mississippi, except in Florida, and rare as a breeder in the southern half of its former breeding range; winters from California, Texas, and Louisiana south to Mexico.

ON THE open savannahs of the South and about the shallow ponds of the Northwestern prairies the Sandhill Crane is found. It is a tall gray bird; and, living in flat countries as it does, it usually sees a hunter before the hunter is aware of its presence. The Crane not only eats water insects, frogs and other such creatures found about ponds and sloughs, but will often walk about in the open pine woods, where it is said at times to eat acorns.

The loud trumpeting cries of the Sandhill Crane are often heard in regions where the birds occur. They are extremely noisy and will waken the camper at the first streak of dawn. They seem not to understand the meaning of a tent, and sometimes two of them will stand and look at it and shout until all sleep forsakes the tired traveler within.

The nest is a large affair of grass and rushes, usually placed in shallow ponds. It is flat, and the top is but a few inches above the water. Two spotted eggs are laid. So many of the birds have been killed for food that to-day they are rare in many places where but a few years ago they were numerous.

Clapper Rail

Rallus crepitans crepitans *Gmelin*

A. O. U. Number 211

Other Names.—Common Clapper; Marsh Clapper; Mud Hen; Sedge Hen; Meadow Hen; Salt-water Marsh Hen.

General Description.—Length, 16 inches. Color above, brownish-gray; below, lighter. Forehead entirely feathered down to base of bill; bill, long and slender.

Nests and Eggs.—Nest: A platform of dead reeds and grasses on the ground in meadows. Eggs: 6 to 15, white to buff, dotted and blotched with chestnut and some lavender.

Distribution.—Salt marshes of the Atlantic coast; breeds from Connecticut to North Carolina; winters mainly south of New Jersey; casual north to Maine; local on Pacific coast.

In the salt water marshes live the Clapper Rails. All along our eastern coast from Connecticut to Mexico they are found, and are especially numerous from Virginia southward. They are plentiful, also, in suitable localities along the Pacific coast. On a visit to a salt marsh one may be impressed with the Marsh Wrens that sing in and above its tallest growths, or by the Great Blue Heron wading in the flats, or even by Gulls that fly along over the winding creeks, but the Clapper Rail one may not see.

It shows a marvelous facility for keeping out of sight. Usually it is observed only when, as one lies quietly in his boat, the bird chances to walk out in some open place. At the first sign of danger it disappears. Hunt as you will in a region where their cries are reverberating on every hand, and the chances are you will not discover one of them. The Clapper Rails have pathways that cross and recross in every direction. These are often arched over by the tall grass in such manner that birds running along them are entirely hidden from view. When the tides are high and their runways covered by water, gunners can induce them to fly by pushing their boats through the flooded marshes. The birds are shot as they rise on the wing in an attempt to escape.

Sora Rail

Porzana carolina (*Linnæus*)

A. O. U. Number 214

Other Names.—Carolina Rail; Common Rail; Soree; Meadow Chicken; Carolina Crake; Little American Water Hen; Chicken-billed Rail; Chicken-bill; Railbird; Ortolan; Mud Hen; Ricefield Rail.

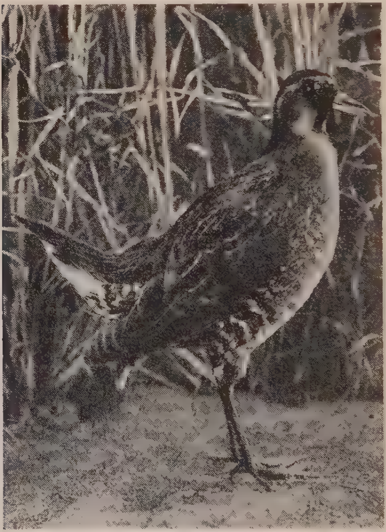
General Description—Length, 9 inches. Color above, olive-brown; below, gray *Bill short and stout;* forehead entirely feathered down to base of bill.

Nest and Eggs.—Nest: On the ground in meadows; a carelessly constructed affair of grass and weeds. Eggs: 7 to 13, more rarely 16, pronounced drab, spotted with chestnut and lavender over entire surface.

Distribution.—North America; breeds from central British Columbia, southern Mackenzie, central Keewatin, and Gulf of St Lawrence south to southern California, Utah, Colorado, Kansas, Illinois, and New Jersey; winters from northern California, Illinois, and South Carolina through the West Indies and Central America to Venezuela and Peru; accidental in Bermuda, Greenland, and England.

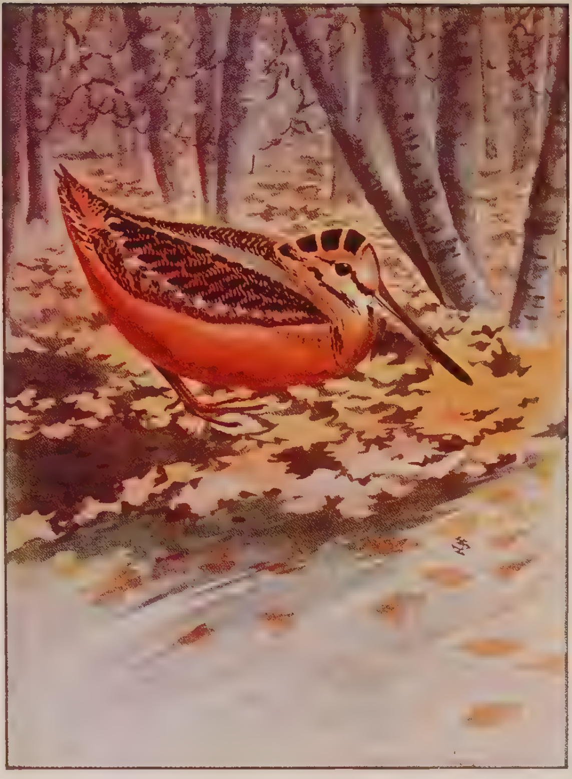
The Sora belongs to a family of marsh-loving birds known as Rails, and like all the members of its family is very skillful in keeping out of sight. The bird student may walk all around a marsh in which a hundred Soras are living and never see or hear one. They are by no means voiceless, but their cries and sharp clucks are usually withheld until evening. About sunset the marsh may resound with their notes from every quarter, and still no bird appears. Should the student enter a canoe or small boat and push out in the midst of the high marsh grass he may perchance have the good fortune to flush one of these secretive little Rails. It rises slowly, and flies away as if with great effort, only to drop out of sight again after going a short distance.

Courtesy of American Museum of Natural History

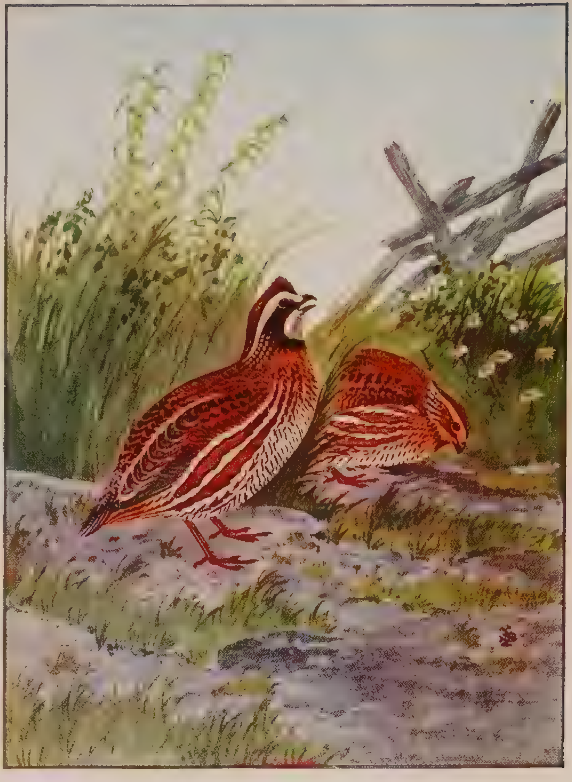


SORA RAIL

In the marshes of the coast country of Virginia and the Carolinas, Soras are shot for food when they appear in the autumn. They have a curious habit of disappearing over night from a region where the day before they were very abundant. Especially do they thus disappear the night of the first sharp frost, for they dislike cold weather. Many ignorant people think that when the frost comes Soras turn into frogs and hide in the mud until the spring.

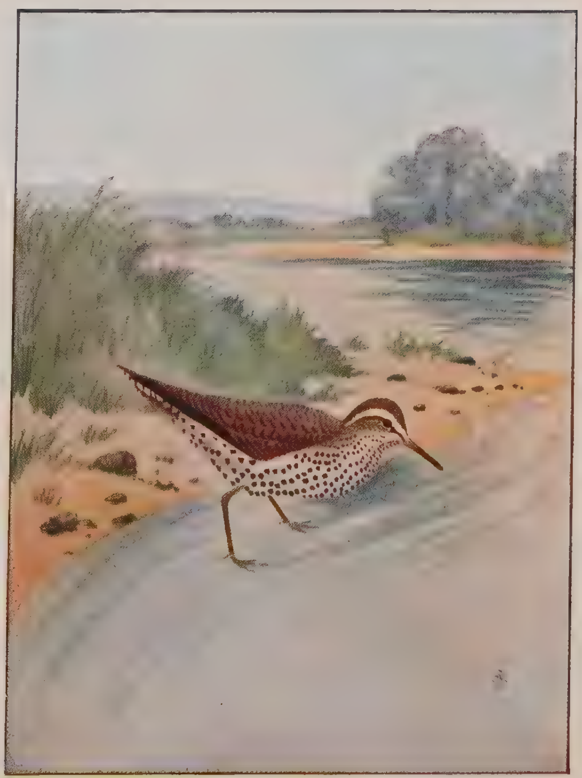


WOODCOCK (1/2 nat. size)

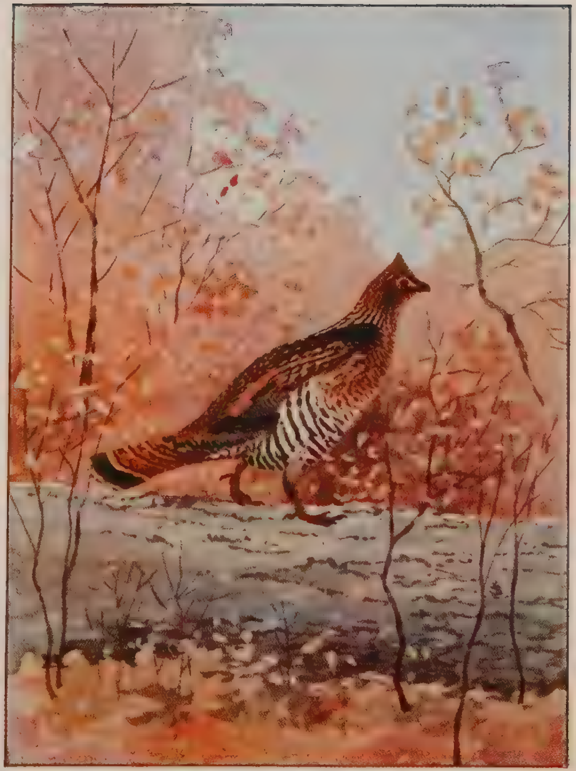


BOB WHITE (2/5 nat. size)

FROM DRAWINGS BY EDMUND J. SAWYER

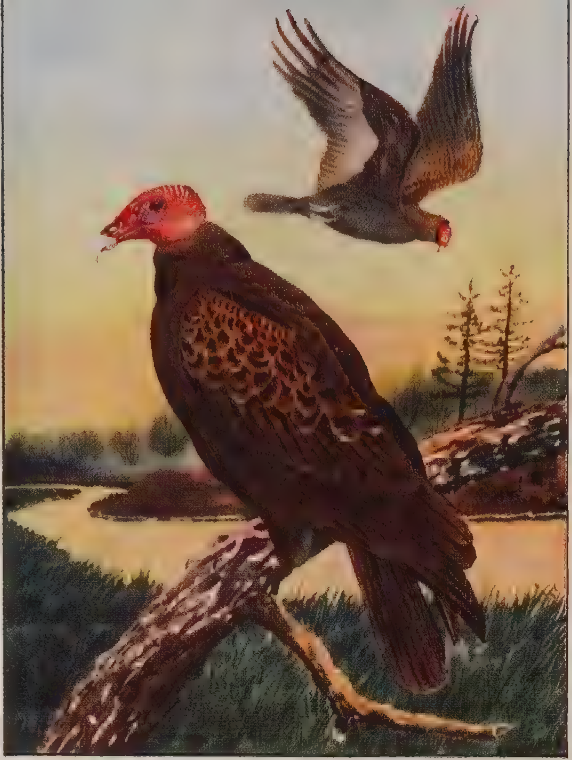


SPOTTED SANDPIPER (1/2 nat. size)

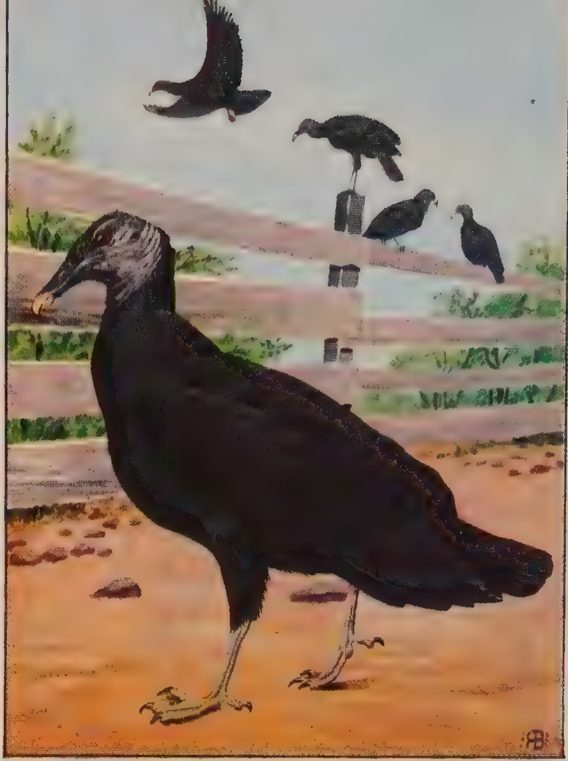


RUFFED GROUSE (1/4 nat. size)

FROM DRAWINGS BY EDMUND J. SAWYER

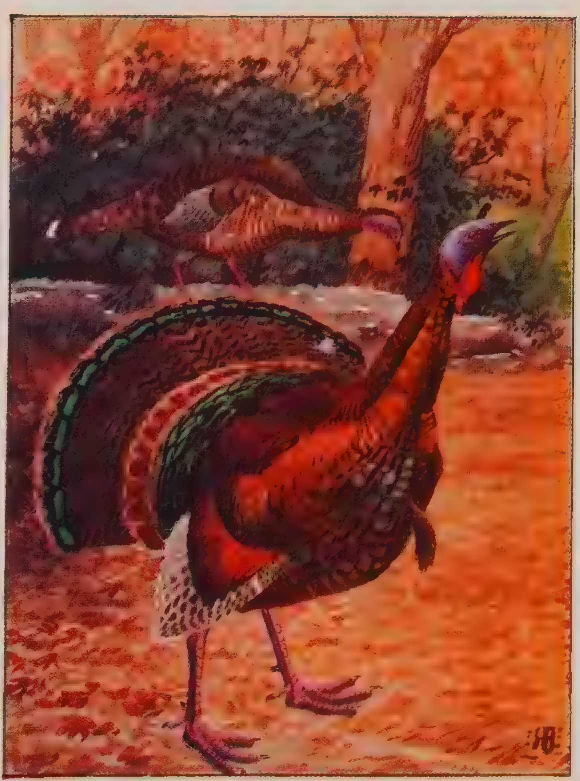


TURKEY VULTURE (1/12 nat. size)

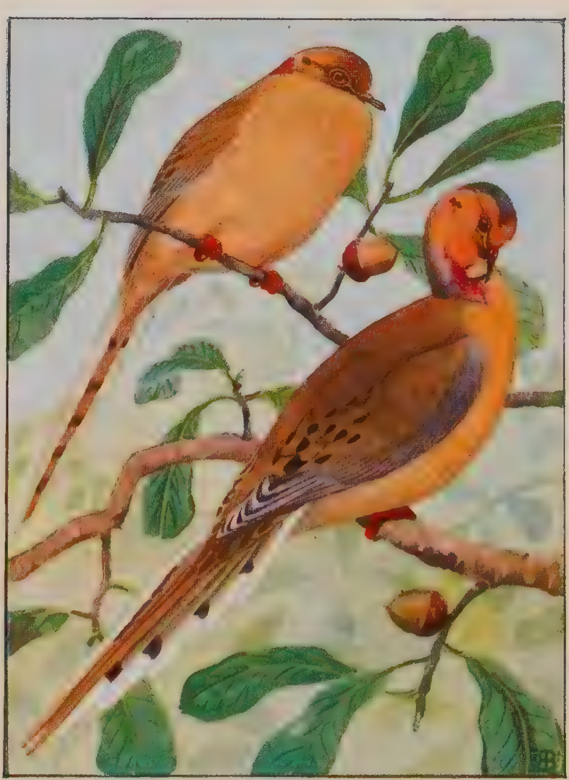


BLACK VULTURE (1/8 nat. size)

FROM DRAWINGS BY R. I. BRASHER



WILD TURKEY (1/12 nat. size)



MOURNING DOVE (3/8 nat. size)

FROM DRAWINGS BY R. I. BRAS

FLORIDA GALLINULE

GALLINULA GALEATA (*Lichtenstein*)

A. O. U. Number 219

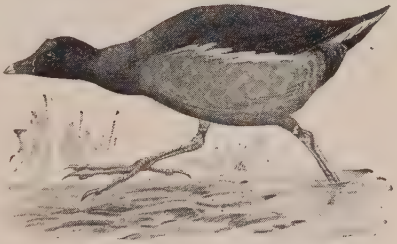
OTHER NAMES.—American Gallinule; Common Gallinule; Red-billed Mud Hen; Water Hen; Water Chicken.

GENERAL DESCRIPTION.—Length, 14 inches. Prevailing color, blackish. Forehead covered by naked shield at base of bill; toes slender and without lobes; bill slender, sharp, and nearly as long as head.

NESTS AND EGGS.—Nest: In the marshes; constructed of dry reeds; often placed on a buoyant platform of the same material, capable of rising and falling with the water; in some places it is built on dry parts of the meadow. Eggs: 6 to 12, buffy-white, rather sparsely spotted with brown.

DISTRIBUTION.—Tropical and temperate America; breeds from central California, Arizona, Nebraska, Minnesota, Ontario, New York, and Vermont south through the West Indies and Mexico to Chile and Argentina, and in the Galapagos and Bermuda; winters from southern California, Arizona, Texas, and Georgia southward; casual in Colorado, Quebec, Nova Scotia, New Brunswick, and Maine.

THE FLORIDA GALLINULE is by no means confined to Florida, as its name might imply. Indeed, the bird is found over a wide area of country, including New York, Arizona, the West Indies, and down through Mexico and on southward to Chile. In the rice-fields of South Carolina they are very plentiful, and may often be seen running across the roads as one drives about the plantations. These birds live about marshes, especially those that have bushes growing in them. They are half swimmers and half waders. At times they wade along the shores like Herons, and again are seen swimming among lily-pads. They sometimes walk over these floating raft-like leaves in regions where the water lily leaves grow large. The Gallinule's toes are very long, and so make it possible for the bird to do this.



FLORIDA GALLINULE

FROM A DRAWING BY R. I. BRASHER

Gallinules look and act somewhat like chickens, and in Europe their near relatives are called Moor-hens, or Water-hens. Sometimes flocks or families of them will come ashore and squat, or even lie down and pick and sun themselves, much as chickens do in the barn-yard. Many "clucks" and other loud calls may be heard coming from a marsh where the Gallinules live. The nest is hidden in the rushes in or near the water.

WOODCOCK

PHILOHELA MINOR (*Gmelin*)

A. O. U. Number 228

OTHER NAMES.—American Woodcock; Wood-hen; Big-headed Snipe; Big Mud Snipe; Blind Snipe; Whistling Snipe; Wood Snipe; Night Partridge; Night Peck; Timber Doodle; Hookum Pake; Labrador Twister; Bogsucker; Bog-bird; Pewee; Whistler; Bigeyes.

GENERAL DESCRIPTION.—Length, 11 inches; color above, brown; below, pale orange-brown; head, large; neck short; eyes large and set far back and high; bill very long and compressed, the lower section shorter than the upper into which it fits at the tip, and the upper section capable of being flexed like a finger; wings, short and rounded; three outer primaries, scythe-shaped; legs, short and stout with thighs feathered; toes, without webs.

NEST AND EGGS.—Nest: On ground, on brushy bottoms or in open woods, usually not far from water; a depression in the leaves without lining. Eggs: 3 or 4, buffy to grayish-white, irregularly and thickly spotted with pale reddish-brown.

DISTRIBUTION.—Eastern North America; breeds from northeastern North Dakota, southern Manitoba, northern Michigan, southern Quebec, and Nova Scotia south to southern Kansas, southern Louisiana, and northern Florida; winters from southern Missouri, the Ohio valley, and New Jersey (rarely Massachusetts) south to Texas and southern Florida; ranges casually to Saskatchewan, Keewatin, Colorado, Newfoundland, and Bermuda.

THE Woodcock is an inhabitant of shaded bogs and marshy swamplands. Here in the soft earth it probes for its food of worms and soft-bodied insects. The bird's head is adorned with a slender bill nearly three inches in length, and so sensitive at its tip that its owner is able to tell when it has found a worm in the mud. The Woodcock's large eyes are placed well up toward the top of its head, and the bird is thus able to note the approach of an enemy, should one appear when it is feeding. Anyone acquainted with the habits of this denizen of the shadows is able to tell upon entering a swamp if the birds are about. Where the Woodcock has been feeding numerous small round holes are left in the soft earth.

When frightened it rises quickly on the wing, but soon drops again into cover. Because of the difficulty of shooting it, and because of the excellency of its flesh when cooked, the Woodcock has long been a great favorite with gunners.

The nest of this species is made on the ground. It is only a slight hollow, scratched in the earth, and is usually among a growth of young trees. It is lined with leaves, and in it are laid four very handsomely spotted eggs. When sitting on its nest the Woodcock is almost invisible. So closely do the feathers of its head and back resemble the dead leaves about it, that keen indeed must be the eye that can discover the Woodcock while it remains motionless.

SPOTTED SANDPIPER

ACTITIS MACULARIA (*Linnæus*)

A. O. U. Number 263

OTHER NAMES.—Peep; Peetweet; Teeter-peep; Teeter-tail; Teeterer; Tip-up; Tilt-up; Sand Lark; See-saw; Sand-peep; Sand Snipe; River Snipe; Bow Snipe; Bowing-bird.

GENERAL DESCRIPTION.—Length, 7 inches. Color above, ashy-olive; under parts pure white, unspotted in winter, but in summer with round black spots. Bill straight, slender and about as long as head; outer and middle toes, webbed at base; inner toes, free; tail, rounded and half as long as wing. This is the only Sandpiper which has large and distinct spots on its under parts; it nearly always teeters when alarmed; and in flight shows a white line on the wings. Found most often near streams and ponds.

NEST AND EGGS.—Nest: A depression in the ground in the vicinity of water; rather well constructed of grass, leaves, and weed stems. Eggs: 4, creamy, buffy, or grayish, blotched with blackish and purplish-gray.

DISTRIBUTION.—North and South America; breeds from tree limit in northwestern Alaska, northern Mackenzie, central Keewatin, northern Ungava, and Newfoundland south to southern California, Arizona, southern Texas, southern Louisiana, and northern South Carolina; winters from California, Louisiana, and South Carolina to southern Brazil and central Peru; straggles to Great Britain and Helgoland.

THE best known of all our shore birds is the Spotted Sandpiper. Its home is along the shores of both fresh and salt water; and about many of the interior ponds and streams it is especially numerous. When one catches sight of the bird it may be running over the rocks close to the margin. Presently it stops and bobs and bows and looks about. "Tip-up," many boys have named it. When forced to fly it darts out over the water, and after a few jerky wing-beats it sails onward close to the water in a curving line back to the shore again. The note it is most usually heard to utter is a sharp "weet," or "tweet," as it takes wing.

Although a bird of the ground it at times lights on the dead limbs of trees, or more usually on a stake or fence. On an island in Maine I once saw one perched on the roof of a lobsterman's hut.

The nest is a slight hollow, usually in the grass, or among weeds well back from the water's edge. When hatched, the young are quickly led to the water to begin their life of chasing along its shores. At this time their legs seem extremely long for the size of the bodies they have to support, and the little fellows present not only a very appealing but an unusually odd appearance.

HUDSONIAN CURLEW

NUMENIUS HUDSONICUS *Latham*

A. O. U. Number 265

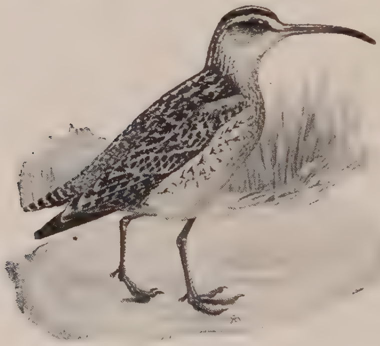
OTHER NAMES.—Jack Curlew; Jack; Striped-head; Crooked-billed Marlin; American Whimbrel; Short-billed Curlew; Curlew Snipe; Sea Snipe.

GENERAL DESCRIPTION.—Length, 18 inches. Prevailing color, red, darker above than below; toes webbed at base.

Nest and Eggs.—Nest: Like that of Long-billed Curlew. Eggs: 4, creamy to pale olive-gray, boldly marked with shades of umber-brown.

Distribution.—North and South America; breeds on the coast of Alaska from mouth of Yukon to Kotzebue Sound, and on the coast of Northern Mackenzie; winters from Lower California to southern Honduras, from Ecuador to Southern Chile, and from British Guiana to mouth of the Amazon; migrates mainly along the Pacific and Atlantic coasts; rare in the interior; casual on the Pribilof Islands and in Greenland and Bermuda; accidental in Spain.

Along the coast of Alaska, beyond the Yukon River, and on the shores of far-off Mackenzie, the Hudsonian Curlew makes its home in summer. In winter it lives in those tropical lands that lie between Mexico and central South America. In the United States it is seen only during the spring and fall migrations. In making its northern and southern flight it appears rarely if ever to fly over the land. It is truly a lover of the ocean, and, like the little Wilson's Plover, never strays far from its tumbling waves.



HUDSONIAN CURLEW
From a drawing by R. I. Brasher

This is a handsome species, and is one of the largest of our "beach birds." Along the coast of North and South Carolina it is often very abundant in the autumn, and even more common during the month of May. At these times flocks of Curlews may be found feeding on mud-flats, or secluded beaches, sometimes in company with other wading birds of like taste. As evening approaches, they rise and wing their way to some isolated and secluded bar or island, there to spend the night in safety.

Curlews have long been favorites among gunners. So much have they been shot that their numbers have been reduced greatly during the past fifty years. A closely related species, the Eskimo Curlew, was, up to twenty-five years ago, an abundant bird. It was shot so continually that to-day it is nearly, if not quite, extinct.

KILLDEER

Oxyechus vociferus (*Linnæus*)

A. O. U. Number 273

Other Names.—Killdeer Plover; Noisy Plover; Chattering Plover; Kildee, Ring-neck.

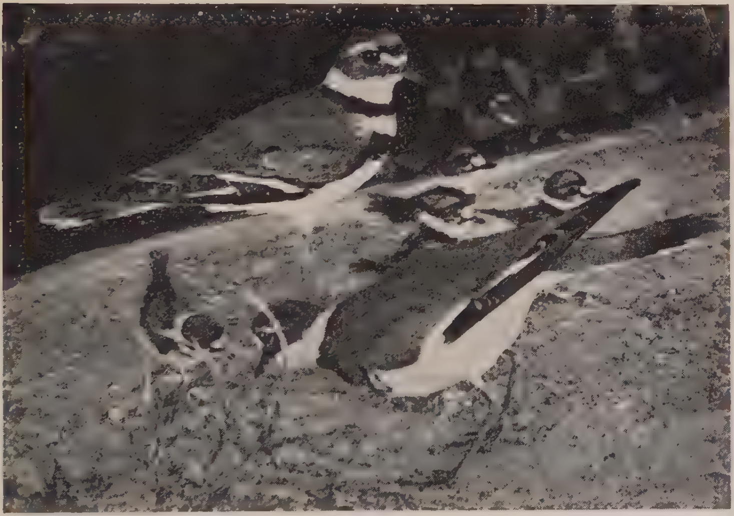
General Description.—Length, 10 inches. Color above, olive-brown; below, pure white. A front view of the bird shows four black bands, two on head and two on breast. Wings, long and, in flight, showing a white V; tail long and rounded; bill slender.

Nest and Eggs.—Eggs: Deposited on the bare ground in fields, usually near water; 4, dull buffy, thickly spotted and blotched with brown and sepia.

Distribution.—North and South America; breeds from central British Columbia, southern Mackenzie, central Keewatin, and central Quebec south to the Gulf coast and central Mexico; winters from California, Arizona, Texas, Indiana, New Jersey, and Bermuda south to Venezuela and Peru; casual in Newfoundland, Paraguay, and Chile; accidental in Great Britain.

Although most of the Plover family are found on sea beaches or salt meadows, the Killdeer Plover is largely an inland bird. It is most numerous in the neighborhood of water, but it is also found in fields, pastures, or wherever the open country is free from bushes or growing grain. Usually they move about in flocks of from six to a dozen and scatter while feeding. Their cry of "kill-dee, kill-dee!" often betrays their presence long before one has discovered them running across the open ground. When taking flight they "bunch," as hunters say, and continue their cries as long as they are on the wing.

Courtesy of the American Museum of Natural History



KILLDEER

The young are in their first plumage

The nest is a slight hollow, sometimes lined with a thin layer of grass or small stones. The four eggs, spotted and scratched with black and chocolate-colored markings, chiefly about the larger end, blend so well with their surroundings that it is often very difficult to find them. In the nest the eggs always lie with their small ends pointing to the center of the group.

In autumn the Killdeers of the more northern part of their range migrate southward, and in winter are found in suitable localities from New Jersey to Peru.

WILSON'S PLOVER

OCHTHODROMUS WILSONIUS (*Ord*)

A. O. U. Number 280

GENERAL DESCRIPTION.—Length, 8 inches. Color above, ashy-gray; below, pure white. Head large; bill long and large; outer toes webbed halfway.

NEST AND EGGS.—Eggs: Laid among the loose pebbles of the open beaches; 3, pale olive or greenish-gray, spotted and splashed all over with blackish-brown.

DISTRIBUTION.—Southern North America; breeds from Texas eastward along the Gulf coast, and from southeastern Virginia (formerly New Jersey) south to the northern Bahamas; winters from southern Lower California, Texas, and Florida south to southern Guatemala and probably to the West Indies; casual in Nova Scotia and New England and at San Diego, California.

WILSON'S PLOVER is a bird that dearly loves the seashore, and is never found far away from it. In small scattered companies they feed along the beach, their feet wet with the receding wave, into the edge of which they run in quest of food. They gather, too, on the bars and mud-flats exposed at low tide, or frequent the beach-ponds and pools, but always wherever found they are within sound of the pounding surf.

In the late spring and summer, when their time is much occupied with domestic duties, they come more to the high, dry parts of the beach. They will run about among the dunes—those little hillocks that the wind builds of the loose, dry sands. Their plaintive calls may be heard on all sides as one comes among them. Looking about one may catch sight of a Plover scudding over the sands, or among the scattered clusters of beach-grass.

The nest of the Wilson's Plover is a slight hollow scratched in the sands, or among the broken sea-shells. When an intruder comes near it, the parents show the greatest signs of distress, and flutter about as if injured. Often they have been seen to squat, and act in a manner which would seem to indicate that they wanted you to believe they were covering their eggs. But be not deceived: they will never approach their nest while you are near.

BOB-WHITE

COLINUS VIRGINIANUS VIRGINIANUS (*Linnæus*)

A. O. U. Number 289

OTHER NAMES.—Quail; Bob-white Quail; Partridge; Virginia Partridge.

GENERAL DESCRIPTION.—Length, 10 inches. Plumage above, chestnut, black ashy, and tawny, mixed; below, different shades of brown with black marks. Feathers of crown, somewhat erectile. Found in open field.

NEST AND EGGS.—Nest: On the ground under old rail fences; sheltered by a thick growth of grass or small bushes, or at the foot of stumps; constructed of dry grasses, leaves, or weed stalks. Eggs: 12 to 18, pure white.

DISTRIBUTION.—Eastern North America from South Dakota, southern Minnesota, southern Ontario, and southwestern Maine south to eastern and northern Texas, the Gulf coast, and northern Florida west to eastern Colorado; introduced in central Colorado, New Mexico, Utah, Idaho, California, Oregon, and Washington.

The closely related Florida Bob-white is found in Florida except extreme northern part, the Texas Bob-white in southeastern New Mexico and southern Texas, and the Masked Bob-white in southern Arizona.

IN THE Northern States the Bob-whites are called "Quail," while in the South most people know them as "Partridges." These birds get their living largely by scratching on the ground; hence in bird books they are classified as belonging to the Scratching Birds, which include Turkeys, Chickens, and Grouse. During most of the year they are found in flocks traveling about through the fields and thickets in search of insects, as well as looking for the seeds and berries of plants.

When a flock or "covey" is scattered by some alarm they soon find each other again by calling. They roost on the ground, a dozen or more together, sitting in a compact body with heads pointed outward in every direction. They have many enemies, such as Hawks, Owls, Cats, Snakes and Weasels.

In spring the birds mate off in pairs. The nest is on the ground, often in a grain field, and usually by some stump, small bush or other object which in a measure serves to protect the nest and sitting parent from the approach of some enemy. From twelve to twenty pure white eggs are laid. The young are covered with down when hatched, and are soon able to follow the mother about in search for food. If you come upon a Bob-white and her brood of young, the anxious mother will flutter along the ground as if her wing is broken. By doing this she hopes to attract your attention until the babies have time to hide.

CALIFORNIA QUAIL

LOPHORTYX CALIFORNICA CALIFORNICA (*Shaw*)

A. O. U. Number 294

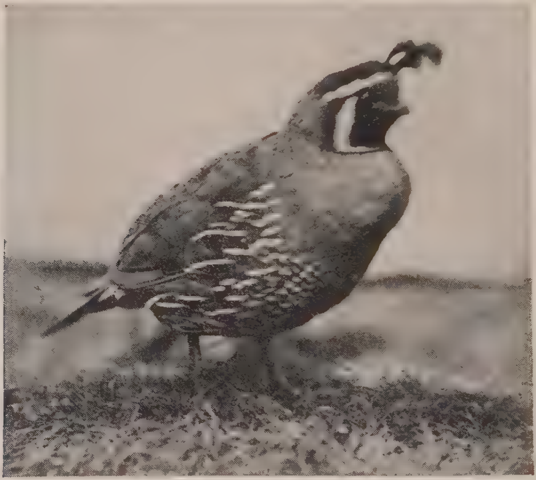
OTHER NAMES.—Valley Quail; Top-knot Quail; California Partridge; Helmet Quail.

GENERAL DESCRIPTION.—Length, 11 inches. Males are ashy-gray above, and slaty-blue and tawny below with chestnut patch; females are ashy-gray above and below. Both sexes have the head adorned with a glossy black crest, narrow at the base and gradually widening into gracefully recurving plumes.

NEST AND EGGS.—Nest: A slight hollow lined with grass, under brush heaps, beside a rock, bushes, old fences or other shelters, sometimes in gardens or even in "stolen" chicken nests. Eggs: 10 to 15, creamy, beautifully marked with spots and blotches of old gold, sometimes pale brown and chestnut over entire surface.

DISTRIBUTION.—Humid districts of Pacific coast region from southwestern Oregon south to Monterey County, California; introduced into Vancouver Island, Washington, and Colorado.

A HANDSOME bird is the California Quail. Its coat is of ashy gray, slaty-blue, and chestnut, the various color areas so distributed as to show to excellent advantage the bird's shapely form. The sight of a covey running through the desert scrub, necks extended and long crests erect, will arouse interest in even the most languid observer. From bill-tip to tail-tip this bird measures 10½ inches.



CALIFORNIA QUAIL

FROM A PHOTOGRAPH BY W. L. FINLEY AND H. T. BOHLMAN

This Quail avoids flying when disturbed, and as a rule seeks the safety its long experience in running has taught it to expect. Its days are spent in the open fields, the scrub or the semi-arid desert. At night it roosts in trees, sometimes several families gathering in a favorite resort.

The nest is made on the ground underneath some sheltering plant or weed. It is a slight hollow scratched in the sand and lined with grass or leaves. Ten to fifteen pointed, handsomely spotted eggs are laid. It is well for the race that many little Quail are brought into the world, as the bird has numerous enemies that prey upon it. Among these are skunks, snakes, wildcats, foxes, coyotes, and hawks. It has human hunters also, for the bird is very popular with sportsmen, and great numbers are shot every year for food.

Ruffed Grouse

Bonasa umbellus umbellus (*Linnæus*)

A. O. U. Number 300

Other Names.—Grouse; Shoulder-knot Grouse; Partridge; Drumming Grouse; Birch Partridge; Pheasant; Drumming Pheasant; Mountain Pheasant.

General Description.—Length, 18 inches. Color above, reddish-brown, spotted; below, yellowish, barred with dark. Both crested and ruffed; tail and wings of equal length; tail with 18 broad, blunt feathers, and somewhat double notched, so that it is nearly half-diamond shape when spread; tarsus partly feathered in front.

Nest and Eggs.—Nest: On the ground, in thickets, dense underbrush, on the borders or in large woods, alongside of a log or at the base of a large tree; constructed of old leaves, a few feathers, weed stems, grass, and roots. Eggs: 6 to 15, usually 10 or 12, varying from whitish through cream to a pale brown, usually without spots but sometimes lightly speckled with shades of brown.

Distribution.—Eastern United States from Minnesota, Michigan, southern New York, and southern Vermont south to eastern Kansas, northern Arkansas, Tennessee, and Virginia, and in the Alleghenies to northern Georgia.

North of this range is found the Canada Ruffed Grouse, and in Alaska, western Canada, and northwestern United States are found the Gray Ruffed Grouse and the Oregon Ruffed Grouse.

This is the bird generally called "Partridge" in the North, and "Mountain Pheasant" in those parts of the Southern States where it is found. The Ruffed Grouse belongs to the family of Scratching Birds, and lives on the ground in the woods.

In the winter it sometimes comes to apple orchards, and flying up on the limbs it eats many of the buds from the twigs. When the snow is deep it often goes to roost by plunging downward through the crust and remaining buried in the snow until morning. Foxes are always on the lookout for these snow beds of the Grouse, and every winter many of the birds are caught by them.

The Grouse lays her eggs in a bed of leaves usually by a log, at the foot of a stump or beneath a small bush. The ten or dozen young can run about as soon as hatched, and within a week can fly with ease. In moving about through the woods in quest of insects or berries, the hen as a rule follows, rather than leads her offspring.

One of the most stirring noises of all the woodland is the long, rolling, booming sound produced by the wings of the male bird in spring as it walks some favorite log and sends its drumming love call far and wide.

WILD TURKEY

MELEAGRIS GALLOPAVO SILVESTRIS *Vieillot*

A. O. U. Number 310*a*

OTHER NAMES.—American Turkey; Eastern Turkey; Northern Turkey; Wood Turkey; American Wild Turkey.

GENERAL DESCRIPTION.—Length, male, 4 feet; female, 3 feet. Prevailing color, iridescent copper-bronze. Head and neck, naked.

NEST AND EGGS.—Nest: Placed on the ground, in tall dense weeds or tangled thickets; very well concealed. Eggs: 9 to 18, usually 9 to 12, warm yellowish-white, evenly dotted over the entire surface with reddish-brown.

DISTRIBUTION.—Eastern United States from Nebraska, Kansas, western Oklahoma, and eastern Texas east to central Pennsylvania and south to the Gulf coast.

In southwestern United States are found Merriam's Turkey and Rio Grande Turkey, and in southern Florida the Florida Turkey is found.

IN THE early days of the settlement of this country Wild Turkeys were found over a large part of North America. They were not then to be found in any other country of the world. Our domestic Turkey has been bred from the descendants of wild birds taken to Europe from Mexico by Spanish explorers.

A Wild Turkey gobbler has many wives. They all slip away from him in the spring to lay their eggs and care for their young, while the gobblers wander about in small bands by themselves. They feed on the ground, but fly up in tall trees in bottom-lands or swamps to roost for the night. In regions where they are plentiful, several families often come together in the fall of the year and form "gangs" of fifty or more that travel about feeding on nuts, berries, seeds, and insects.

The Wild Turkey is the largest of our American game birds. Those I have seen killed varied from nine to sixteen pounds in weight, although many are of much larger size. Specimens have been taken that reached the surprising weight of forty pounds. Few birds have a better eye for detecting their enemies, and to this ability alone may be attributed the fact that in the wilder parts of our country some of these noble birds may still be found.

MOURNING DOVE

ZENAIDURA MACROURA CAROLINENSIS (*Linnæus*)

A. O. U. Number 316

OTHER NAMES.—Carolina Dove; Wild Dove; Turtle Dove; Dove.

GENERAL DESCRIPTION.—Length, 12½ inches. Prevailing color above, grayish-blue; reddish-fawn. Tail longer than wing, strongly graduated, consisting of 14 relatively narrow and tapering feathers.

NEST AND EGGS.—Nest: Placed in trees (usually low down), bushes, cactus, dense brier thickets, or on ground or on cliff; a frail structure of twigs, so flat that the fact that the eggs do not roll off oftener is remarkable. Eggs: 1 or 2, white; 2 and sometimes 3 broods in a season.

DISTRIBUTION.—North America; breeds from British Columbia, Saskatchewan, Manitoba, Ontario, and southern Nova Scotia south throughout the United States and Mexico, and locally in lower California and Guatemala; winters from southern Oregon, southern Colorado, northern Ohio, and North Carolina to Panama; casual in winter in Middle States.

FEW birds in North America are found over so wide a range as the Mourning Dove. It may be seen in various Provinces of Canada, in almost all parts of the United States, and in many of the States of Mexico. In the spring and early summer one usually sees them in pairs in open woodlands, orchards, and about the fields. They feed on the ground, and are often found walking along country roads. When flushed they sometimes strike their wings together, as they rise, producing a clapping sound.

The cry of this Dove is a sweet, cooing call that has in it a note of surprising sadness, hence the name *Mourning* Dove.

The nest is thin and flat, and is placed generally on the limb of a tree, or in a thick vine-covered bush. Many build their nests in apple-trees, on stumps, or on an old rail-fence. On the western plains, where trees are not at hand, the nests are made in a slight hollow scratched on the ground, sometimes in the shelter of a little sage bush. Two white eggs are laid.

GROUND DOVE

CHÆMEPELA PASSERINA TERRESTRIS (*Chapman*)

A. O. U. Number 320

OTHER NAME.—Mourning Dove.

GENERAL DESCRIPTION.—Length, 6½ inches; smallest of American Doves. Color above, grayish-brown; below, grayish-reddish. Wing moderate with rounded tip; tail from $^2/_3$ to ¾ length of wing, decidedly rounded, with 12 feathers, these relatively broad and with broadly rounded tips.

NEST AND EGGS.—Nest: On the ground or from 2 to 20 feet above it in bushes, stumps, vines, or small trees; simply a few curved twigs with the addition sometimes of pine-needles. Eggs: 2, pure white or creamy white.

DISTRIBUTION.—Florida, including Keys, South Carolina, and westward near the Gulf coast through Alabama to Louisiana into western Texas, southern Arizona and Lower California; occasional or casual northward to North Carolina, Virginia, District of Columbia, Maryland, Pennsylvania, New Jersey, New York City, and Tennessee.

In southwestern United States, a related variety, the Mexican Ground Dove, occurs.

THIS little Dove of the Southern States is the smallest of all the Pigeon Family found in North America. It is an extremely dainty bird, and as a rule is very dignified as it walks along the garden paths or more quiet streets of southern towns in quest of seeds, on which it largely feeds. When choice food is discovered it sometimes loses its gentle manners, and will fight Jays, Robins, or others of its own species if they come near. It has a soft, cooing note that is often heard in the orange groves of Florida.

The Ground Dove makes a frail nest of grasses and rootlets. It may be looked for in a variety of places, and selects different situations at different seasons of the year. Thus in central Florida nests have been found on stumps, February 28 and March 3; on the ground in oat fields, in April, May, and June; in orange trees and on grape arbors, in August and September. Few birds breed during so many months of the year as does this charming little ground walker. The eggs are pure white and are two in number—never more. Many colored people of the South believe that bad luck will come to anyone who kills a Ground Dove.

TURKEY VULTURE

CATHARTES AURA SEPTENTRIONALIS (*Wied*)

A. O. U. Number 325

OTHER NAMES.—Carrion Crow; Turkey Buzzard.

DESCRIPTION—Length, 2½ feet; spread of wings, 6 feet. Tail, long, and rounded; wings, when folded, reaching to or beyond the tip of tail; head and upper part of neck, entirely bare or with only a few bristles and with skin deepy corrugated. Adults: Head and upper neck of a *reddish tinge* and some shades of blue and white; neck and upper parts, blackish, glossed with green or purple; beneath, dull brownish-black; feathers above, broadly edged with dull grayish-brown; secondaries edged with gray; shafts of wing- and tail-feathers, pale brown or yellowish-white; bill, dull whitish; iris, brown; feet, flesh-colored.

NEST AND EGGS.—Eggs: Commonly 2, sometimes 1, and very rarely 3; laid, from February to June, in a cave, a cavity between rocks, in a hollow log, or on the ground; white or creamy, variously spotted with lavender or purplish-brown blotches.

DISTRIBUTION.—From southern Lower California and northern Mexico north to southern British Columbia, Saskatchewan, western Manitoba, northern Minnesota, southern Ontario, western and southern New York, and New Jersey; casual in Wisconsin, Michigan, northern Ontario, and New Brunswick; winters throughout most of its regular range in the East, but further west retires to California, Nebraska, and the Ohio valley.

THE Turkey Vulture, or Turkey "Buzzard," spends much of its time in the sky. It is perhaps the most graceful of all our birds when on the wing. Once it lights on the ground, however, all its beauty of movement passes away. It moves forward with a most awkward stride that seems to be a cross between a step and a hop. At a distance it is attractive, but at close range it is very homely. The bare wrinkled skin on and about its head is red, which doubtless has suggested the "Turkey" part of its name.

This Vulture sometimes kills very young pigs, but usually its food consists of carrion. It eats with equal relish a dead and decaying snake, fish, cow, horse, or alligator. In fact, any dead animal, or part thereof that its keen eyesight discovers as it sails about the country, serves as a banquet for the Turkey Vulture.

The bird builds no nest, but lays its two beautifully spotted eggs in a hollow stump or prostrate log in the deep woods. Sometimes nests are found in small caves or crevices of rocks in hilly regions. In the Southern States, where the bird is very abundant, hundreds may be found roosting together in the trees of a swamp, or on small wooded islands along the coast. They are always seen about towns, and often rest for hours on the roofs of buildings, looking down sleepily at the people as they pass along the streets below.

BLACK VULTURE

CATHARISTA URUBU (*Vieillot*)

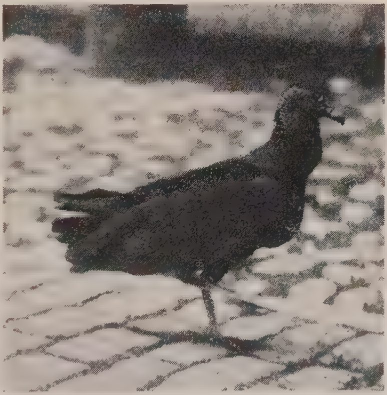
A. O. U. Number 326

OTHER NAMES.—Black Buzzard; Carrion Crow; Black Scavenger.

DESCRIPTION.—Length 27 inches; spread of wings, 4½ feet. Head, naked; feathers of neck extended up back of head in a point; wings, when folded, do not reach to the tip of the tail; compared with the Turkey Vulture, its tail is *decidedly shorter*, wing-strokes more frequent, is built more stumpily and weighs more. Adults (sexes alike): Head and a part of the neck, covered with a *black* wrinkly and lumpy skin; general color of entire plumage, blackish; *shafts of primaries, white fading to dull gray at base;* bill, blackish; the tip, dull yellowish-white; iris, brownish-hazel; legs, grayish-white with black claws.

NEST AND EGGS.—Eggs: 1 to 3, laid on the ground under the protection of logs or bushes or in rock cavities; pale greenish or bluish-white, marked irregularly round the larger end with various shades of brown or brownish-purple; deposited from March to May.

DISTRIBUTION.—From western Texas, Kansas, Illinois, Indiana, and southeastern Virginia south through the Southern States, Mexico, and Central America to southern South America; casual in Ohio, New York, Maine, Quebec, New Brunswick, and Nova Scotia.



A BLACK VULTURE ON THE STREET IN CHARLESTON, S. C.

FROM A PHOTOGRAPH BY H. L. JOB

THE Black Vulture has various local names, such as "Carrion Crow," "South Carolina Buzzard," and "South Carolina Eagle." Its feeding and nesting habits closely resemble those of the Turkey Vulture, but with certain small differences. They usually go in flocks of from forty to a hundred birds, and feed not singly, but in great numbers, upon the carcass of a dead cow or horse. They are not seen sailing about the sky, except when very near their food, but when found on the wing they are generally going rapidly forward in a straight line. While flying they flap their wings for several strikes, and then sail a short distance before flapping again. The plumage is dull black instead of brown like the Turkey Vulture, and the skin of the bare head and upper neck is black instead of red.

In Charleston, South Carolina, they may be seen at any hour of the day sitting along the ridge of the meat-market, or in the streets below, hissing and contesting over scraps of waste meat thrown to them by the men who keep the meat stalls.

COOPER'S HAWK

ACCIPITER COOPERI (*Bonaparte*)

A. O. U. Number 333

OTHER NAMES.—Pigeon Hawk; Chicken Hawk; Quail Hawk; Big Blue Darter; Swift Hawk; Striker.

DESCRIPTION.—Length: male, 18 inches; female, 20 inches. Spread of wings, 30 to 36 inches; tail round; five outer primaries notched on inner webs. Color above, dark bluish-slate; below, white.

NEST AND EGGS.—Nest: Usually in tall trees from 10 to 50 feet from the ground in secluded woodlands; often an old Crow's or some other Hawk's nest is appropriated; being frequently occupied for a number of years in succession, and, additional material being added each spring, some of the nests become very large and bulky structures. Eggs: 3 to 6 pale bluish or greenish white, sometimes plain but usually spotted with pale reddish-brown.

DISTRIBUTION.—North America; breeds from southern British Columbia, southern Alberta, southern Keewatin, central Quebec, and Prince Edward Island south to southern border of the United States; winters from southern British Columbia, Colorado, Nebraska, Ohio, and Massachusetts south to Costa Rica, and occasionally farther north.

THIS is the bird widely known throughout the country as the "Chicken Hawk," and the name is well deserved. No Hawk or other bird is such a scourge to small bird-life as this swift-flying feathered leopard. With the quickness of thought it darts into a flock of feeding birds, and before an alarm can be sounded has made off with one of them. Dashing around the corner of a barn it will seize and carry away a young chicken from the very feet of the astonished farmer that is feeding his fowls. People say it moves so fast that all you see of it is a blue streak; for this reason perhaps it is known in many places as the "Blue Darter." This Hawk rarely perches *on* a tree, but often perches *in* a tree, and from its hiding place dashes out upon its victims.

The eggs of the Cooper's Hawk are white, or nearly so, and are placed in a nest cleverly hidden in the main fork of a tree in the woods. Farmers kill these birds and destroy their nests whenever they find them, and yet the Cooper's Hawk is so shrewd and so well able to care for himself that his numbers seem not to grow less.

BALD EAGLE

HALIÆETUS LEUCOCEPHALUS LEUCOCEPHALUS (*Linnæus*)

A. O. U. Number 352

OTHER NAMES.—White-headed Eagle; White-headed Sea Eagle; American Eagle; Black Eagle; Gray Eagle; Washington Eagle. The last three names refer to the immature Bald Eagle.

GENERAL DESCRIPTION.—Length: male, 30 to 35 inches; female, 34 to 43 inches. Spread of wings, 6½ to 7¾ feet. Plumage, dark brown. *Tarsus, bare for an inch or more above base of toes;* five outer primaries deeply notched on inner webs.

NEST AND EGGS.—Nest: In large trees from 20 to 90 feet above ground, sometimes in niches of rocky cliffs; a large coarsely built affair of good-sized sticks, roots, twigs, seaweed, bits of turf, vine or plant stalks and lined with roots or grass. Eggs: 2, rarely 3, ivory-white with a granular surface.

DISTRIBUTION.—United States to southern Lower California and northern Mexico breeding in suitable location throughout its range; rare and local in California and in arid interior.

From northwestern Alaska, northwestern Mackenzie, central Keewatin, and northern Ungava south to British Columbia and the Great Lakes, ranges the Northern Bald Eagle.

THIS is the bird that is the emblem of our national independence—the "American Eagle" we sometimes call it. It is not bald, although one might think so from its name. When three years of age the feathers of the head and neck become pure white, and always remain so. There is a story that Eagles sometimes carry off babies, but no scientific record of this ever has been made. Eagles eat rabbits, and wild ducks, and some other birds. Sometimes they catch lambs, but I am quite sure they are more fond of fish than any other food. They catch fish by swooping down to the surface of a lake or river, and often they rob the Osprey of the fish it has taken. They will also eat dead fish cast up on the beach by the ocean breakers.

Bald Eagles are far more numerous about lakes, rivers, and along the ocean than elsewhere. Usually their nests are built in very tall trees in swamps, or on lonely headlands or islands. The nest is often four or five feet in thickness and is composed of a cart-load of sticks, twigs, moss and other materials. Two whitish eggs are laid, and the young remain in the nest many weeks before they are able to fly. The female, which is larger than the male, measures about seven feet from wing tip to wing tip, and weighs eleven or twelve pounds.

DUCK HAWK

FALCO PEREGRINUS ANATUM *Bonaparte*

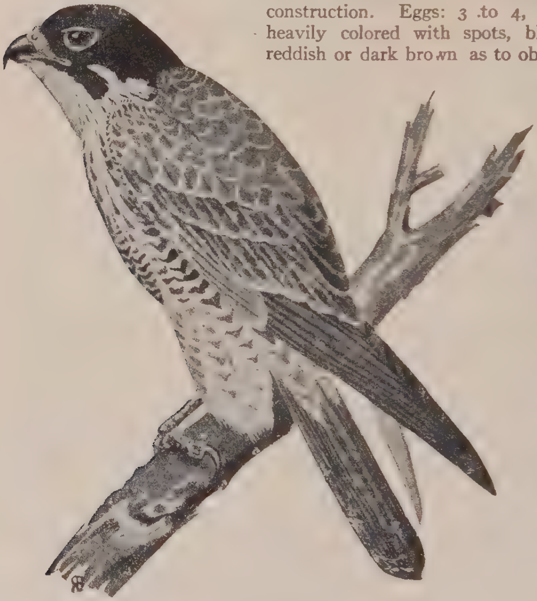
A. O. U. Number 356*a*

OTHER NAMES.—Peregrine Falcon; American Peregrine; Great-footed Hawk; Wandering Falcon; Tercel (male); Eagle Hawk.

GENERAL DESCRIPTION.—Length: male, 18 inches; female, 19 inches. Spread of wings, 40 to 46 inches. Color above, bluish-ash; below, yellowish barred. Outer primary notched on inner web; tarsus broadly bare at the base, only slightly feathered in the front, and about the length of the middle toe with claw; upper section of bill with an additional point or tooth near the tip and a corresponding notch in the lower section.

NEST AND EGGS.—Nest: Usually in crevices on inaccessible cliffs, more rarely in natural cavities of trees; no apparent attempt at any construction. Eggs: 3 to 4, dull white, usually so heavily colored with spots, blotches, and specks of reddish or dark brown as to obscure the ground color.

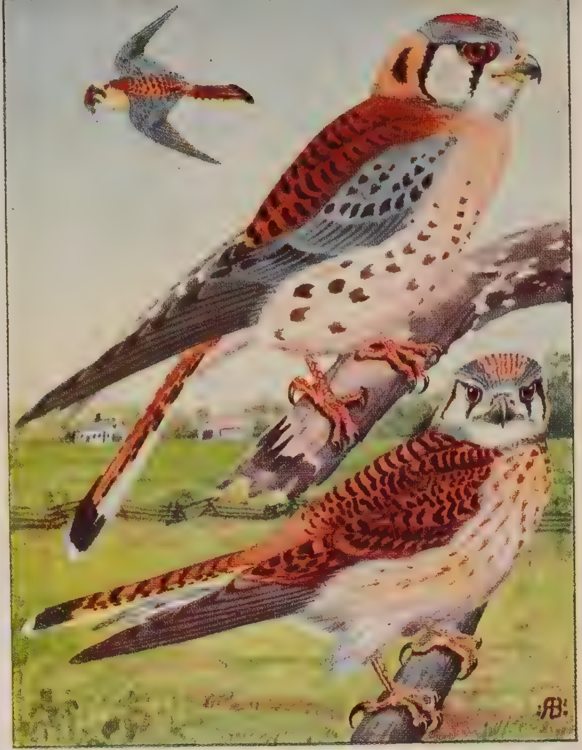
DISTRIBUTION.—North and South America; breeds locally (except in northwest coast region) from Norton Sound, Alaska, northern Mackenzie, Boothia Peninsula, and western central Greenland south to central Lower California, Arizona, southwestern Texas, Kansas, Missouri, Indiana, Pennsylvania, and Connecticut (in mountains to South Carolina); winters from southern British Columbia, Colorado, and New Jersey (occasionally further north) to the West Indies and Panama; occurs also in South America south to northern Chile.



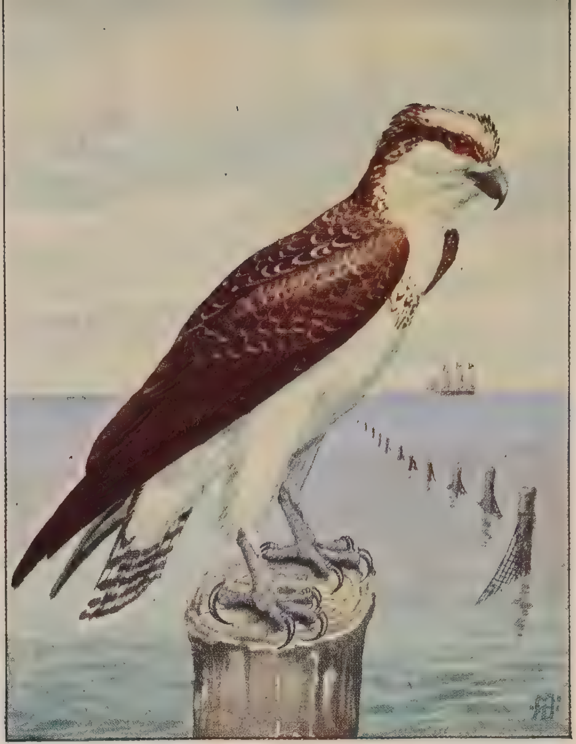
DUCK HAWK

FROM A DRAWING BY R. I. BRASHER

THE Duck Hawk is a famous bird in history. It was birds of this species that were used by "knights of old" when falconry was in vogue. Tame Peregrines, as they were called, were carried on hunting trips and were liberated when game-birds were sighted. The Falcon would at once give chase, and soon overtake the swiftest bird that flew. It could easily kill such large species as the big Blue Heron.



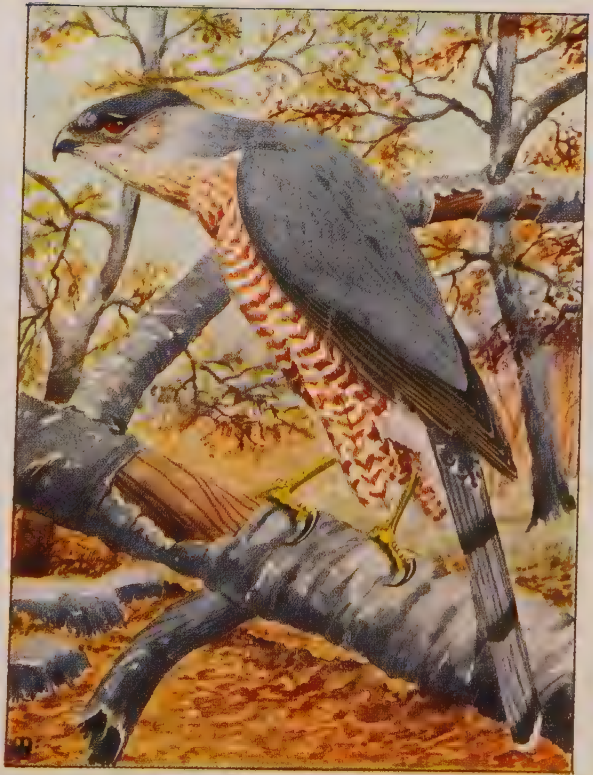
SPARROW HAWK (3/8 nat. size)



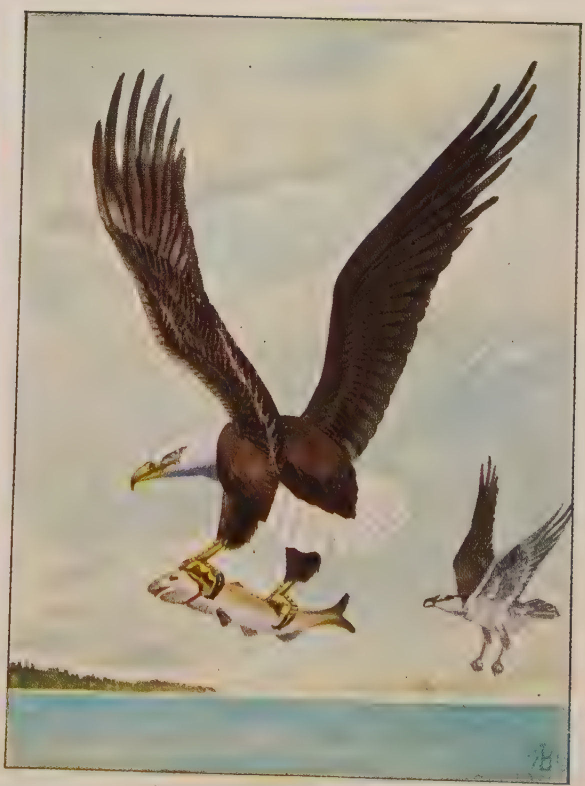
OSPREY (1/8 nat. size)

FROM DRAWINGS BY R. I. BRASHER

From Nature's Secrets, by G. Clyde Fisher

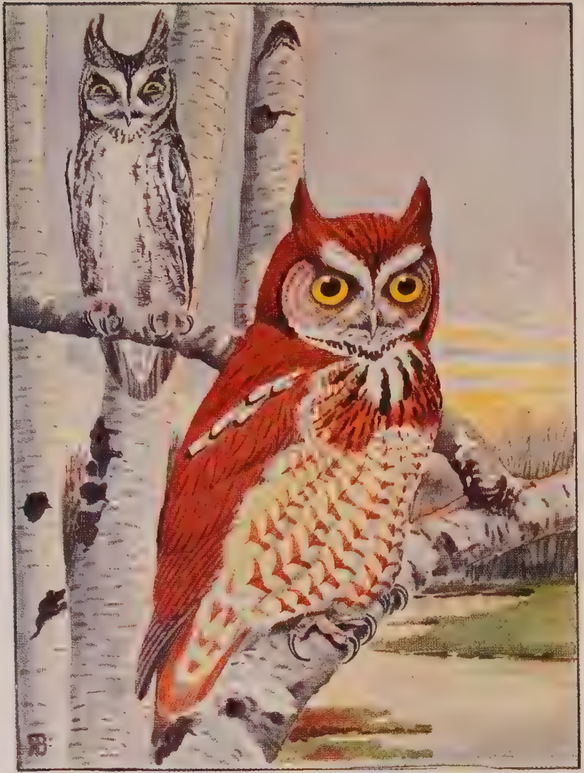


COOPER'S HAWK (4/9 nat. size)

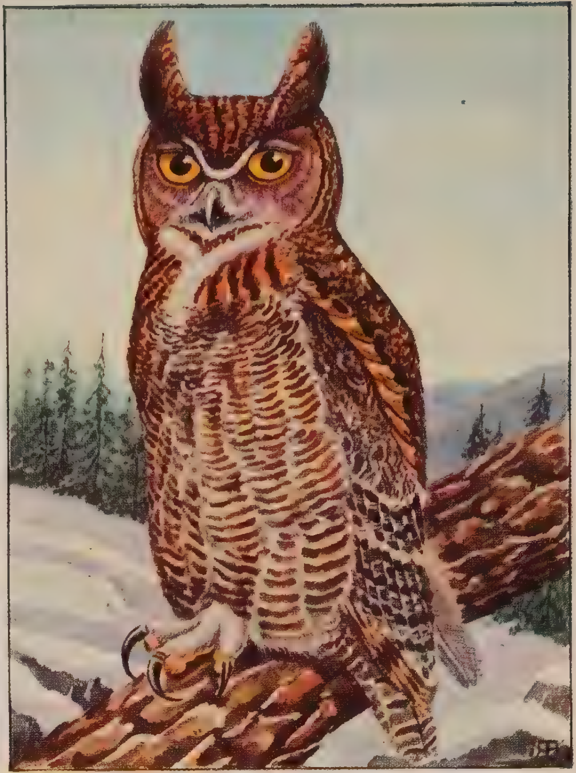


BALD EAGLE (1/16 nat. size)

FROM DRAWINGS BY R. I. BRASHER

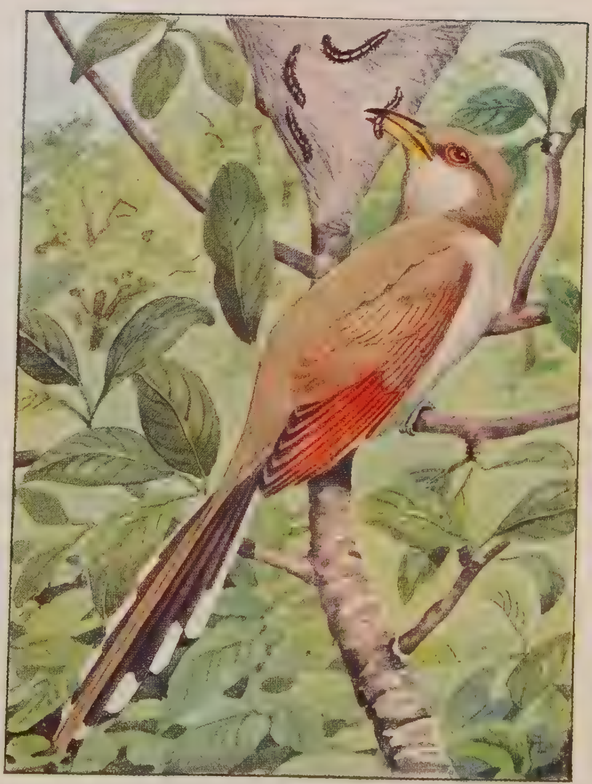


SCREECH OWL (1/4 nat. size)

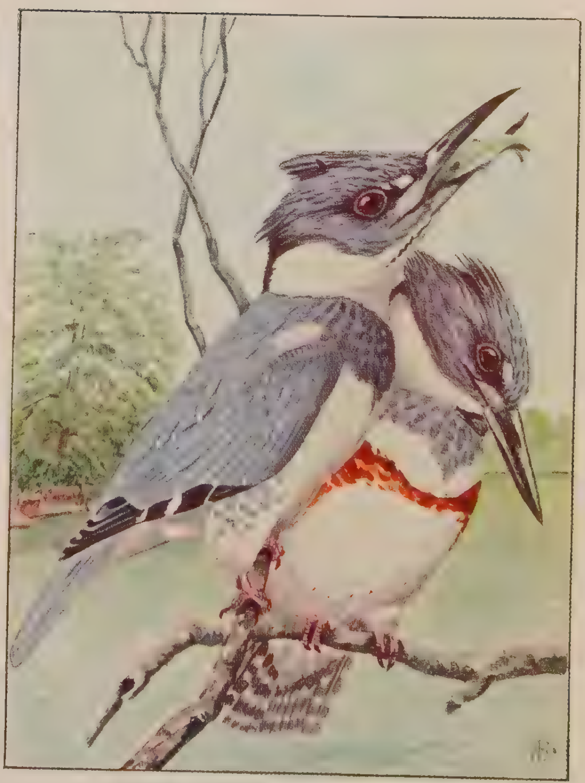


GREAT HORNED OWL (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER



YELLOW-BILLED CUCKOO (3/8 nat. size)



BELTED KINGFISHER (1/4 nat. size)

FROM DRAWINGS BY R. I. BRASHER

In this country falconry has not been practiced, but the Duck Hawk is well known to hunters. It is very bold, and will sometimes seize and bear off a wounded wild duck almost under the very nose of the astonished gunner. Usually it captures its prey in the air. In fact, this is such a well established habit that when one appears near a flock of flying ducks these birds usually descend with great rapidity and alight in the water. In this position they seem to have small fear of their swift enemy. A few pairs of Duck Hawks have been known for many years past to rear their young every summer in nests built on the cliffs along the Palisades. From this rocky retreat they make dashes over to the parks lying in the center of New York City, and capture many of the tame pigeons that daily resort there to feed.

SPARROW HAWK

FALCON SPARVERIUS SPARVERIUS *Linnæus*

A. O. U. Number 360

OTHER NAMES.—American Sparrow Hawk; American Kestrel; Rusty-crowned Falcon; Grass-hopper Hawk; Mouse Hawk; Kitty Hawk; Windhover; Short-winged Hawk; "Cleek-cleeuk."

GENERAL DESCRIPTION.—Length, 11 inches. Color above, cinnamon-rufous; below, pale rusty and whitish. Two outer primaries notched on inner webs; tarsus but slightly feathered in the front, broadly bare on back, and decidedly longer than the middle toe.

NEST AND EGGS.—Eggs: Deposited in natural cavities of trees, deserted Woodpecker holes, in rock cavities, holes in banks, artificial nesting boxes, or in crannies of outbuildings without nesting material; 4 or 5, ground color varying from creamy-white to reddish-buff, specked, spotted or clouded with shades of Indian red and brown, usually largest and more numerous or sometimes wreathed at greater end; some eggs minutely dotted all over with dark brown, some so heavily splashed as to conceal the ground color.

DISTRIBUTION.—North America east of the Rocky Mountains; breeds from the Upper Yukon, northwestern Mackenzie, southern Keewatin, and Newfoundland south to Texas and the eastern Gulf States (except Florida); winters from Kansas, Indiana, Ohio, and Massachusetts south through Mexico to Costa Rica.

Close relatives (sub-species) of the Sparrow Hawk extend the range of this bird over practically all of North and South America.

THIS is the smallest and the best known of all our Hawks, and may be found almost any place in the United States. It inhabits fields and prairies, open woods and deserts and in all these regions people know it and have for it a name. "Killy Hawk" and "Mouse Hawk" are two of the names by which it is called. It flies about much in the spring and summer, and its cry of "killy! killy! killy!" may be heard far across the fields.

While searching for food it sits motionless on some elevated perch, like a stake, dead tree, or telephone pole. Its sharp eyes watch the ground beneath. All at once it flies toward the earth, for something has moved in the grass that has attracted its attention. The bird may pause and hover to get a better view, then comes the plunge and the luckless grasshopper, mouse, lizard, or rarely a small bird, is carried away.

The four or five prettily-marked eggs are laid in the cavity of a tree, generally an abandoned Flicker's nest. In some places where trees are scarce, nests have been found in crevices about buildings, or in holes in tall cliffs.

OSPREY

PANDION HALIAETUS CAROLINENSIS (*Gmelin*)

A. O. U. Number 364

OTHER NAMES.—American Osprey; Fish Hawk; Fishing Eagle.

GENERAL DESCRIPTION.—Length, 2 feet; spread of wings, 4½ to 5½ feet. Upper parts, dark brown; head and under parts, white.

NEST AND EGGS.—Nest: In a tree or on the ground; composed principally of coarse sticks, seaweed, and any old rubbish which is handy. Eggs: 2 to 4, usually 3, yellowish or dull white, spotted and blotched with Indian red and different shades of brown, sometimes so heavily at the large end as to obscure the ground color; some marked at small end, and others almost plain.

DISTRIBUTION.—North and South America; breeds from northwestern Alaska, northwestern Mackenzie, central Keewatin, southern Ungava, and Newfoundland south to Lower California, western Mexico, and the Gulf coast; winters from the southern United States through Lower California and Mexico to the West Indies and Central America; occurs also in South America south to Peru and Paraguay.

THE Osprey in its size and manner of flight suggests a large Hawk or an Eagle. It lives about the larger rivers and lakes of the country, but is particularly plentiful along the sea-coast. Its food consists entirely of fish that it captures in a most bold and direct manner. "Fish Hawk," many people call it. Flying along leisurely over the water it suddenly detects a fish below, and after hovering a moment plunges headlong with half-closed wings. The impact of the blow sends the water high in air. A moment later, with dripping plumage, it rises aloft and bears away the unfortunate prey in its talons. The fish seems always to be carried with its head pointing in the direction the bird is moving.

Ospreys frequently assemble in colonies to rear their young, and from twenty to forty nests may at times be counted over an area covering only two or three miles. The nests are very large, and are placed in the tops of tall trees, on broken tree snags, and occasionally on the ground. The splotched and spotted eggs are among the most beautiful laid by North American birds. The young in the nest possess many curious and interesting traits.

BARN OWL

ALUCO PRATINCOLA (*Bonaparte*)

A. O. U. Number 365

OTHER NAMES.—Monkey-faced Owl; Golden Owl; White Owl; Monkey Owl; American Barn Owl; Straw Owl; Grass Owl; Church Owl.

GENERAL DESCRIPTION.—Length, 18 inches; spread of wings, 44 inches. Plumage, whitish-tawny, speckled with black.

NEST AND EGGS.—Nest: Almost anywhere—in church towers, outbuildings, hollow trees, holes in steep banks, deserted nests, or even in ground burrows; constructed of a few sticks, hay, straw, bones, or other refuse. Eggs: 3 to 11, usually 5 to 7, dull white, unspotted.

DISTRIBUTION.—Greater part of United States and Mexico; breeding north to Long Island, New Jersey, Pennsylvania, western New York, Ohio, northern Indiana, northern Illinois, southern Nebraska, Colorado, and upper Sacramento valley, northern California and occurring, more or less irregularly, farther northward to Massachusetts, Vermont, Ontario, Michigan, Wisconsin, Minnesota, Oregon, and southern British Columbia; southward over whole of Mexico, whole of Lower California, and eastern Central America to eastern Nicaragua, at least in winter.

THIS is without doubt the queerest looking and most unusual acting creature in feathers found throughout the length and breadth of the land. Its face resembles a monkey to a most startling extent, from which fact the bird is often called the "Monkey-faced Owl." When cornered and unable to escape by flight, it has a way of leaning forward until its bill almost reaches the floor, and then with its weird face thrust out at you its head swings from side to side. This movement continues with a slow but regular action like the pendulum of some strange-looking clock. While viewing this striking performance a child does not know whether to laugh or run.

Barn Owls often live about hollow trees. Many roost and nest in barns, old mills, and church steeples. They seem as much at home in the steeple in a city church as in the outbuilding of the most lonely farm. It is with most people a bird of mystery, for it keeps out of sight so much that, even where it is fairly numerous, few know of its existence.

This Owl is one of the most successful mousers in the bird-world, and fortunate, indeed, is the farmer who is blessed by the presence of one or more of them.

BARRED OWL

STRIX VARIA VARIA *Barton*

A. O. U. Number 368

OTHER NAMES.—Hoot Owl; Rain Owl; Wood Owl; Round-headed Owl; Swamp Owl.

GENERAL DESCRIPTION.—Length, 20 inches; spread of wings, 44 inches. Plumage brown, barred with whitish. No ear-tufts or horns.

Nest and Eggs.—Nest: Almost always in a hollow tree on the old chips but sometimes in a deserted Crow's or Hawk's nest. Eggs 2 to 4, usually 3, white, unspotted.

Distribution.—Middle eastern North America; breeds north to Newfoundland, southern Quebec, northern Ontario, southern Keewatin, Manitoba, and Saskatchewan, west to eastern Montana, eastern Wyoming, and eastern Colorado; south to Virginia, western North Carolina, northwestern South Carolina, northern Georgia, Tennessee, Kentucky, southern Illinois, Missouri, and northern Arkansas, and occasionally to Louisiana.

The Florida Barred Owl is found on the coastal plain from eastern Texas to Florida and South Carolina, and the Texas Barred Owl in middle southern Texas.

BARRED OWL

From a drawing by R. I. Brasher

This is the big "Hoot Owl" of the bottom-land woods. Its loud, laughing, hooting calls echo through the forests during the early hours of darkness, and may fill with terror the mind of a city boy who never heard one before. At times three or four will get together and call. When this occurs there is no forest serenade that can quite equal the uproar that ensues. This bird will answer the poorest kind of an imitation of its note, and the camper may at times call several to the trees about his camp-fire of an evening.

The eggs are laid usually in the hollow of some forest tree, but as one cannot hunt birds' nests very well at night, and as Owls usually remain very quiet by day, the nests are not often discovered.

Barred Owls eat a wide variety of things. In part, their food consists of frogs, lizards, and insects. Spiders are eaten, also fish and craw-fish at times. A good many small birds are caught, and now and then this big night-flier visits the poultry yard and carries off a hen, but such raids are not very frequent. On the whole, this Owl is supposed to render mankind more service than harm.

Screech Owl

Otus asio asio (*Linnæus*)

A. O. U. Number 373

Other Names.—Little Horned Owl; Gray Owl; Red Owl; Little Dukelet; Mottled Owl; Shivering Owl.

General Description.—Length, 10 inches; spread of wings, 22 inches. Dichromatic; in gray phase, brownish-gray dappled; in red phase, pattern the same but color chestnut-red. Ear-tufts, large and conspicuous; four or five outer primaries notched or cut away on inner webs; toes scantily feathered toward their tips.

Nest and Eggs.—Nest: In a deserted Woodpecker hole, in natural hollow in a tree or stump, in outbuildings, or boxes placed in trees for their use. Eggs: 4 or 5, white, laid on a few sticks, bits of grass, leaves, and feathers.

Distribution.—Eastern North America from Minnesota, Ontario, and New Brunswick south to northeastern Texas and Georgia, and west to about the 100th meridian; accidental in England.

Sub-species or varieties of the Screech Owl extend the range of this bird all over United States.

The shivering cry of the little Screech Owl is a familiar sound to most people who pass the summer in small villages, or in the country. In the evenings a pair of these birds with their family of young may come into the trees of the yard, or even perch on the veranda railing, and indulge in their cries and wailings for an hour at a time.

One reason why Owls are largely such enemies to birds is that their feathers are very soft, in fact each one is edged with a little down, which makes it possible for them to fly with absolute silence. A Hawk swooping down on its prey produces a roaring sound in the air, but the Owl can descend as noiselessly as a shadow upon its victim. A mouse on the ground, or the sleeping bird on the limb, has little chance for escape when the Owl comes his way.

In addition to some birds and many mice, these little Owls will eat spiders, earth-worms, and almost anything they can catch and hold. Some Screech Owls are brown, while others are gray. Why this is true we do not know; neither age nor sex seems in the least to determine the color.

Great-Horned Owl

Rubo virginianus virginianus (*Gmelin*)

A. O. U. Number 375

Other Names.—Big Hoot Owl; Cat Owl; Virginia Owl; Virginia Horned Owl.

General Description.—Length, 24 inches; spread of wings, 60 inches. Color above, sooty-brown, or dusky, mottled with grayish-white; below, whitish, barred with dark. Ear-tufts very conspicuous, about 2 inches in length; toes fully feathered; 3 or 4 outer primaries notched or cut away on inner webs.

Nest and Eggs.—Nest: Generally in a deserted Hawk's, Crow's, Eagle's, Osprey's or Caracara's nest or (in some parts of its range) in a cave, on a ledge, or in a hollow tree; constructed of twigs, weed stalks, roots, and feathers when in an old nest, or eggs deposited on the bare ground amidst a collection of old bones, skulls, fur and feathers of quadrupeds and birds. Eggs: 2 or 3, white.

Distribution.—Eastern North America from Ontario, Quebec, New Brunswick, and Newfoundland south to the Gulf coast and Florida, west to Wisconsin, eastern Minnesota, Iowa, and eastern Texas.

Varieties of the Great-horned Owl are to be found over the greater part of North and South America.

The Great-horned Owl has been well named the "Tiger" of the bird world. It is large, and is so very strong that it can easily carry away a grown hen. It also catches many other birds, including Grouse and Quail. Quite naturally, therefore, it is very unpopular with both the birds and people who raise hens. Yet in spite of these annoying habits, this Owl is said to be of great benefit in some places to the fruit-growers. Rabbits gnaw the bark of many small fruit trees and kill them. These Owls are very fond of Rabbits, and catch a great many. In this way they pay in part for the chickens they take. They also eat mice and rats, skunks, and various other kinds of small mammals.

The Great-horned Owl mates very early in the year, often before the snow is all off the ground. The two or three large white eggs are laid either in the hollows of trees or in old Hawk or Crow nests. They are birds of the deep woods, and come out into the open country only at night. All day they sleep, unless the day happens to be dark and cloudy. Then sometimes you may hear the Owl's cry, a deep "whoo, hoo, hoo, hoo, whoo, whoo!"

ROAD-RUNNER

GEOCOCCYX CALIFORNIANUS (*Lesson*)

A. O. U. Number 385

OTHER NAMES.—Ground Cuckoo; Chaparral Cock; Snake Killer; Lizard Bird; Churca; Paisano; Correcamio; Cock of the Desert.

GENERAL DESCRIPTION.—Length, 20 to 24 inches. Color above, olive streaked with tawny-brown and buffy-whitish; below, whitish streaked on chest. Tail, long and graduated; feathers of head bristle-tipped; entire plumage, coarse and harsh.

NEST AND EGGS.—Nest: Usually in cacti, mesquite, sage brush, or thorny bushes; a large coarse structure of sticks, lined with grass, feathers, strips of bark, snake skin, or rootlets, with slight depression. Eggs: 4 to 6 usually, but sometimes 2 or 12, chalky white or pale yellowish.

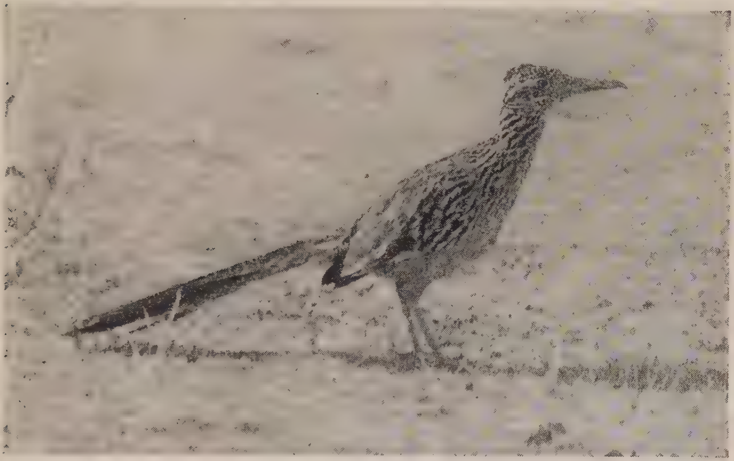
DISTRIBUTION.—California, Colorado, Kansas, and western and middle Texas, south through Lower California and the tableland of Mexico to Puebla.

In southern Arizona one of these strong-legged birds ran for fully two hundred yards before my galloping horse ere it turned aside for shelter into a roadside thicket of cactus and mesquite. The Road-runner seldom flies, for it lives almost entirely on the ground, and when pursued can usually escape by running.

Its food consists of beetles, grasshoppers, lizards, and such other small animal life as can readily be captured. In Texas I once saw one carrying in its beak what appeared to be a young bird, hotly pursued and scolded by an adult Mockingbird. The nest of sticks and twigs is built in a low tree or cactus, and is not a very bulky structure. This latter fact is not surprising when we recall that the bird belongs to the family of American

Cuckoos, all the members of which build nests very light and unsubstantial in appearance.

The Road-runner is about two feet in length, and the color and appearance of the coating of feathers changes little during the season, the markings of the male, female, and young virtually being the same at all periods of the year. The species is found generally through the semiarid regions of the Southwestern States, and is usually known as the Chaparral Cock.



ROAD-RUNNER

FROM A PHOTOGRAPH BY W. L. FINLEY AND H. T. BOHLMAN

YELLOW-BILLED CUCKOO

COCCYZUS AMERICANUS AMERICANUS (*Linnæus*)

A. O. U. Number 387

OTHER NAMES.—Rain Crow; Rain Dove; Storm Crow; Chow-Chow; Kow-Kow.

GENERAL DESCRIPTION.—Length, 11 or 12 inches. Color above, grayish-brown; below, white.

NEST AND EGGS.—Nest: Generally in fork of a tree as high as 25 feet up; a frail structure of twigs, grass, leaves, and catkins, so shallow that it is remarkable the eggs do not roll out oftener. Eggs: 2 to 6, pale dull, greenish-blue.

DISTRIBUTION.—Parts of North and South America; breeds from North Dakota, Minnesota, southern Ontario, Quebec, and New Brunswick south to Louisiana and northern Florida, and west to South Dakota, Nebraska, and Oklahoma; migrates through the West Indies and Central America; winters in South America south to Ecuador, Bolivia, and Argentina.

The California Cuckoo which ranges over western North America is a close relative of this bird.

The Cuckoo is a bird of mystery, so often is it heard and so seldom is it seen. The plaintive "cow, cow, cow!" notes issuing from the depth of grove or thicket, often in cloudy weather, have caused many people living in the country to believe that it foretells the coming of rain. For this reason it is widely known as the "Rain Crow."

It is a very slender, grayish bird, and is not often seen except as it slips quietly from one tree to another. Its movements are so queer, and it keeps out of sight so much, one is almost inclined to believe the bird has just done something wrong, or is thinking of committing a crime.

The Cuckoo's nest is built of small twigs, and sometimes a few grass blades. It is generally placed on the limb of a thick-growing tree or vine-covered bush and is such a frail affair that at times the pale, bluish eggs may be seen through the nest from the ground below.

This is a very valuable bird on a farm, for it eats untold numbers of caterpillars that are preying on the leaves of fruit trees. Cuckoos all leave the United States in autumn, and do not return until the warm days of spring.

Belted Kingfisher

Ceryle alcyon (*Linnæus*)

A. O. U. Number 390

Other Names.—Kingfisher; the Halcyon.

General Description.—Length, 12 inches. Color of upper parts and of belt, bluish-gray; under parts, white; females with a reddish band across abdomen. Head, crested.

Nest and Eggs.—Nest: At extreme end of a burrow in the bank, from 4 to 15 feet long. Eggs: 5 to 8, laid on the bare floor of the enlarged extremity of the tunnel.

Distribution.—North America and northern South America; breeds from northwestern Alaska, northwestern Mackenzie, central Keewatin, northern Quebec, and Newfoundland south to southern border of the United States; winters from British Columbia, Nebraska, Illinois, Indiana, Ohio, and Virginia south to the West Indies, Columbia, and Guiana, and irregularly as far north as Massachusetts, New Hampshire, and Ontario.

The cry of the Kingfisher is very similar to the rattling call of a policeman's whistle. It may be heard as one paddles his canoe up a winding creek, or along the shores of a river or lake. Sitting on a stake or limb overlooking the water, it sees you in ample time to drop from its perch, and sounding a shout of alarm it darts on to its next favorite resting place.

The Kingfisher's food is fish, which it catches by plunging in the water from the air above. Often it hovers above its prey on rapidly beating wings before striking downward. Although its white eggs are generally laid in a deep hole, which it burrows in a steep bank, nests have been found in Florida situated in hollow limbs reaching out over the water.

When first hatched the young are naked, and not down-covered like many baby birds.

In summer, Kingfishers are found in almost all parts of North America. When winter arrives, those in the northern sections of their range travel southward. Many, however, remain in the United States wherever open water may be found, for this bird is a fisherman all the year, and does not like to travel any farther than is necessary to secure its food.

Downy Woodpecker

Dryobates pubescens medianus (*Swainson*)

A. O. U. Number 394*c*

Other Names.—Little Guinea Woodpecker; Little Sapsucker (incorrect); Tommy Woodpecker; Black and White Driller.

General Description.—Length, 6½ inches. Upper parts, black and white; under parts, white.

Nest and Eggs.—Nest: Generally in a dead tree. Eggs: 4 to 6; white.

Distribution.—Northern and central parts of eastern North America from southeastern Alberta, Manitoba, and southern Ungava to eastern Nebraska, Kansas, and the Potomac valley, and in mountains to North Carolina.

Sub-species of the Downy Woodpecker are to be found over all of temperate North America.

Courtesy of Outing Publishing Co.

DOWNY WOODPECKER AT WORK

The Downy Woodpecker is equally at home in the forest, orchard, or the trees of the lawn. One living near shade or apple trees soon becomes familiar with its sharp call-notes, produced sometimes singly, and again rapidly repeated until they produce the nearest approach to a song of which the bird is capable.

Its food consists mainly of boring grubs and larvæ that it gets by digging little holes in the bark of trees. Many of these insects are very injurious, so the bird is the fruit-grower's friend.

Like other Woodpeckers, the Downy digs for its nest a hole in dead limbs or stumps. This labor is performed of course in the spring, when the birds are mating; but Downy digs out another hole late in autumn, and uses it as his bedroom in winter. Go to the place some cloudy winter morning and strike sharply on the tree with a stick or stone, and soon at the entrance hole a little head with two bright eyes will appear and look down at you in a manner that seems to say: "All right, you knocked, what do you want?"

From the above, we see that Downy does not run off to the South when snow comes. No, indeed; in company with bands of Chickadees and Nuthatches you will find him, or one of his friends, busy at work most of the time hunting through the groves for his favorite food.

RED-HEADED WOODPECKER

MELANERPES ERYTHROCEPHALUS (*Linnæus*)

A. O. U. Number 406

OTHER NAMES.—Redhead; Tricolor; Tricolored Woodpecker; White-shirt; Jellycoat. Shirt-tail; Patriotic Bird; Flag Bird.

GENERAL DESCRIPTION.—Length, 9 inches. Head, red; black with white patches under parts, white.

NESTS AND EGGS.—Nest: Generally in a dead tree but sometimes in a living tree telegraph pole, or fence post. Eggs: 4 to 6, white.

DISTRIBUTION.—Eastern United States and British provinces from southeastern British Columbia, Wyoming, Colorado, and Texas, east to the Atlantic coast; north, regularly, to northern New York (breeding in Adirondack region), Ontario, Manitoba, central Alberta, and southwestern Saskatchewan (rare); south to southern Florida and Gulf coast to Texas; rare and local east of the Hudson, where breeding, however, north to Vermont; casual in Nova Scotia, New Brunswick, Utah, New Mexico, and Arizona; irregularly migratory in northern parts of its range.

SOME birds, like some people, have what we call more "personality" than others. The Red-headed Woodpecker has much personality. For one thing, it is a strikingly beautiful bird, with its white, black, and red plumage. Its food is of wide variety, and is taken not only by digging in dead trees in true Woodpecker fashion, but many insects are caught on the wing in much the manner the Phœbe or Kingbird employs when feeding. It is also fond of berries, some of which are cultivated, and many others are wild.

The Redhead is very noisy, especially during the nesting season. One of its notes, often heard, closely resembles the call of the little tree-toad. In many Southern towns they are numerous in the groves, on the lawns, or even perched on the ridges of the houses, from a loose shingle or the tin coping of which they sound their long-rolling love call.

Each spring, as a rule, the birds dig new nesting holes. These are generally made in dead trees or tree snags. In towns their nests are often made in the telephone poles that line the streets. If a nest is destroyed, the birds will dig a new hole, and a second setting of eggs will be laid. I once knew a female Redhead thus to lay five sets of eggs in one summer.

FLICKER

COLAPTES AURATUS (*Linnæus*)

OTHER NAMES.—Yellow-shafted Woodpecker; Golden-winged Woodpecker; Clape; Pigeon Woodpecker; Yellowhammer; High-hole; High-holder; Yarrup; Wake-up; Wood-pigeon; Heigh-ho; Wick-up; Hairy Wicket; Yawker Bird; Walk-up; Ant Woodchuck.

GENERAL DESCRIPTION.—Length, 11 inches. Upper parts, grayish-brown, barred with black; under parts, lilac-brown, black, and yellowish.

NEST AND EGGS.—Nest: In tree or stub. Eggs: 4 to 9, white.

DISTRIBUTION.—Eastern North America from tree limit south to the Gulf coast.

THE Flicker is a very abundant bird in the United States, and is known by a great variety of names. Here are a few of the hundred or more by which it is called: "Yellowhammer," "Golden-winged Woodpecker," "High-holder," "Wake-up," and "Yawker Bird." Although it is a Woodpecker, it gathers its food almost entirely on the ground, and three-fifths of all it eats consists of ants.

Flickers are very noisy, especially in the mating season. Often two will face each other on a limb and bob and call "whee-chew, whee-chew!" over and over again in a soft, melodious voice.

For their nests they dig holes in dead trees, or the dead limbs of living trees. The bottom of the nest is lined with fine chips, on which there is laid from four to nine glossy white eggs. The young are hatched naked and for many days continue to be most odd looking specimens of bird-life. Flickers dig new holes each year. There are left all over the country thousands of their old nests, which are used by many other birds that like to lay their eggs in hollows, but do not have bills suitable for chiseling out holes in the hard wood.

WHIP-POOR-WILL

ANTROSTOMUS VOCIFERUS VOCIFERUS (*Wilson*)

A. O. U. Number 417

OTHER NAME—Nightjar.

GENERAL DESCRIPTION.—Length, $9^1/_2$ inches. Plumage, a variegation of gray, brown, black, and buff. Tail, rounded.

NEST AND EGGS—Eggs: 2, white, beautifully marked with spots of brown, yellowish-brown, and purple; laid on old leaves or decayed bits of wood, usually in deep woods, beneath dense underbrush, or in shady ravines.

DISTRIBUTION.—Eastern United States and southern Canada; north to Nova Scotia, New Brunswick, Maine, Vermont, southern Quebec, Ontario, southern Keewatin, Manitoba, and Saskatchewan; west to eastern edge of the Great Plains in eastern Nebraska, Kansas, etc., during migration to west-central Texas, casually to eastern Colorado; breeding southward to northern Louisiana, southern Georgia, northwestern Florida, eastern Texas (?), etc.; wintering in Gulf States (Florida to southern Texas) and southward through Mexico to Central America.

Stephens' Whip-poor-will is found in southern Arizona, New Mexico, and southwestern Texas.

MANY people think the Nighthawk and Whip-poor-will are merely different names for the same bird, but the truth is the birds are quite different. The "whip-poor-will" cry that we often hear in the country on summer nights is never uttered by the Nighthawk. The bird does not catch its insect food in long wandering flight through the sky, but by short flights in the woods and about the borders of woodlands and in orchards. It does not make a nest, but lays its two yellowish-white speckled eggs on the dead leaves that are usually found on the ground in thickets when spring comes.

When a mother Whip-poor-will is frightened from her nest she will flutter along the ground and do her best to make you think she is injured. She is trying to get you to follow her so you will not see her eggs. The young are covered with down when hatched, and are as pretty a pair of little wood babies as you will find in many a day's walk. Ignorant people sometimes think that if a Whip-poor-will lights on your doorsteps at night and sings it will bring bad luck to the household.

NIGHTHAWK

CHORDEILES VIRGINIANUS VIRGINIANUS (*Gmelin*)

A. O. U. Number 420

OTHER NAMES—Goatsucker of Carolina; Bull-bat; Mosquito Hawk; Will-o'-the-Wisp; Pisk; Piramidig; Long-winged Goatsucker.

GENERAL DESCRIPTION—Length, 10 inches. Plumage, a variegation of black, gray, brown, and buff; white patch on wing. Tail emarginate.

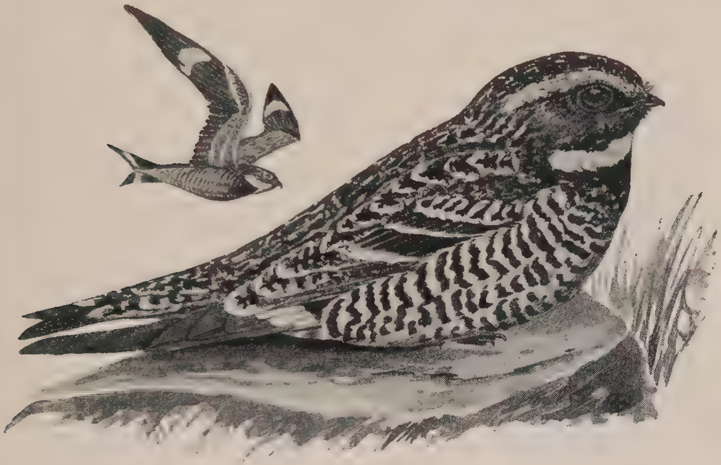
NEST AND EGGS.—Eggs: 2, grayish-white, densely spotted and blotched with gray, black, and pale purple; laid in gravelly spaces of open fields, on large rocks, on gravel roofs in cities, or (more rarely) in open spaces.

DISTRIBUTION.—North and South America; breeds from southern Yukon, central Mackenzie, central Keewatin, northern Quebec, and Newfoundland south to northern parts of Gulf States and west to edge of Plains from Minnesota to northeastern Texas; migrates through the Greater Antilles and Central America; winters in South America from Brazil south to Argentina.

Four other varieties or sub-species of the Nighthawk extend the breeding range of this bird over nearly all of North America.

THE Nighthawk, or "Bull-bat," is another bird that seeks its food in the sky. It is most often seen as it flies about high over the trees or buildings in quest of insects that we cannot see, but yet are swarming through the upper air. As it flies it gives sharp little squawks, and now and then produces a low booming sound when it drops in a long sweep toward the earth.

The bird makes no nest, but lays its two mottled eggs on the ground in the open woods, pastures, or fields. The eggs so closely resemble the earth that it is difficult to see them when one flushes the setting bird. In large cities, Nighthawks have a habit of laying their eggs on the flat tops of tall buildings.



NIGHTHAWK

From a drawing by R. I. Brasher

The roosting place is generally the bare, level limb of some tree, on which the bird crouches lengthwise—never crosswise. On the prairies of the Northwest one may often see them roosting on the top of the long snow fences built to protect the railway tracks from snow-drifts.

CHIMNEY SWIFT

CHÆTURA PELAGICA (*Linnæus*)

A. O. U. Number 423

OTHER NAMES.—Chimney Swallow; American Swift.

GENERAL DESCRIPTION.—Length, 5½ inches. Plumage, sooty-blackish, lighter below. Tail, less than ½ length of wing, rounded or even, the feathers with spiny tips.

NEST AND EGGS.—Nest: Inside a chimney; of small twigs glued together with a gelatinous fluid secreted by the salivary glands forming a semi-circular wall pocket. Eggs: 4 to 6, pure white.

Distribution.—Eastern North America; north to New Brunswick, Nova Scotia, Province of Quebec, southern Labrador, northern Ontario, Manitoba, and Alberta, accidentally to southern Greenland; west to western border of Great Plains and (accidentally?) New Mexico; breeding southward to southern Florida and thence westward along Gulf coast to southeastern Texas; occasional straggler to the Bermudas.

This is another bird that has entirely changed its nesting habits since the coming of the white man to this country. A long while ago their nests were made in hollow trees, but to-day it is very rare that one is found, except in a chimney. It is made of fine dry twigs all glued together and stuck against the chimney bricks. This glue is secreted by glands in the mouth.

After the nesting season Chimney Swifts have the habit of gathering in numbers to roost for the night in some large chimney. They will return to this place every night for several weeks until the time comes for them to migrate south. One evening I counted more than one thousand going to roost in the chimney of a Southern college building.

We never see one of these little sooty black birds perched on a tree or hopping along the ground for the reason that its legs are so weak they will not bear its weight, except as it hangs with its toes to the chimney's side. The ends of its tail-feathers are sharp and strong, and with them the bird braces against the brick where it rests.

CHIMNEY SWIFT

From a drawing by
R. I. Brasher

Aside from a twitter one often hears as the bird circles overhead it appears to have very few notes, none of which could very properly be called a song.

Ruby-Throated Hummingbird

Archilochus colubris (*Linnæus*)

A. O. U. Number 428

Other Names.—Hummingbird; Common Hummingbird: Hummer; Ruby-throat; Honey-sucker.

General Description.—Length: male, $3\frac{1}{4}$ inches; female, $3^{4}/_{5}$ inches. Upper parts, bronze-green; under parts, red, bronze-green, and white.

Nest and Eggs.—Nest: An exquisite cup, less than two inches across, of felted plant, fern, or dandelion-seed down, covered so perfectly with moss and lichens and fastened with spider webs as to appear a mere protuberance on the limb, and lined with a layer of the finest down. Eggs: 2, pure white.

Distribution.—Eastern North America: north, regularly to southern Labrador, Quebec, Ontario, and Keewatin (to about latitude 52°), and in the interior to northern and central Alberta; west to about middle portion of Great Plains (along streams); breeding southward to middle Florida and along the Gulf coast to west-central Texas; wintering from middle and southern Florida and southern Texas southward through southern Mexico and Central America to Panama; casual in Cuba in migration.

THERE are over four hundred kinds of Hummingbirds in Central and South America, and there are seventeen in western United States, but the only one found east of the Mississippi River is the Ruby-throat. It is the smallest of all our birds, and weighs only one-tenth of an ounce. Although it is little it is very brave, and will attack any creature that comes near its nest. A female will often leave her eggs and strike down at your head, if you invade the neighborhood of her home.

The nest is a very soft little affair, made of plant-down, and covered with lichens. It is set on a limb well up from the ground, and looks for all the world like a knot. It is about the size of a walnut. Two white eggs are laid. The birds feed on nectar of blossoms, and small insects that they capture in and about the flowers. In autumn, Hummingbirds leave, and the most of them go to Central and South America for the winter, crossing the Gulf of Mexico as they do so, where it is from 700 to 900 miles in width. The male is much more brilliantly colored than the female or young.

RUBY-THROATED HUMMING-BIRD

FROM A DRAWING BY R. I. BRASHER

KINGBIRD

TYRANNUS TYRANNUS (*Linnæus*)

A. O. U. Number 444

OTHER NAMES.—Field Martin; Bee Martin; Beebird; Tyrant Flycatcher.

GENERAL DESCRIPTION.—Length, 8 inches. Upper parts, black and gray; under parts, white. Tail, square or slightly rounded.

NEST AND EGGS.—Nest: Frequently in the orchard, sometimes in tall sycamores near streams, a substantial structure of twigs, weed stalks, grass, roots, particles of wool and down well combined and symmetrically edged, lined with feathers, horse-hair, fine rootlets, and wool. Eggs: 3 or 4, white to pale pink with strong bold spots of umber and chestnut.

DISTRIBUTION.—North and South America; breeds from southern British Columbia, southern Mackenzie, southern Keewatin, northern Ontario, central Quebec, and Newfoundland south to central Oregon, northern New Mexico, central Texas, and central Florida; winters from southern Mexico to Colombia, British Guiana, Peru, and Bolivia; casual in Cuba in migration; accidental in Greenland.

For its size the Kingbird is one of the bravest birds in all the country. Most birds have a very great fear of Hawks, and with good reason, for Hawks are continually killing them. At the first sight of one of these fierce pirates of the air the small birds as a rule dash in terror to the cover of the nearest bush. The Kingbird is the one notable exception to the rule. Mounting in the air with brave twitterings he dashes at his enemy and attacks so fiercely that the larger bird quickly leaves the neighborhood. Likewise he assails every Crow that comes near his nest. He will pursue such great birds as Turkey Vultures, and on rare occasions even alight on their backs and appear to hold on by firmly seizing a feather. Under such astonishing treatment from such a little bird the great Vulture flaps its wings as if in the wildest panic, while it strives with all its power to escape from its tormentor.

Courtesy of Outing Publishing Co.

AN ENTIRE KINGBIRD FAMILY

From a photograph by H. K. Job

Kingbirds spend much of their time perched on stakes, poles, or tree-tops, where they can watch for such insects as are so unfortunate as to fly near their watch-towers. The nest of this interesting bird is usually built in an apple-tree or other tree of small size. In the South the nests are often placed in bushes growing in ponds or shallow lakes.

This bird has been accused of destroying honey bees, but investigations have proved that the percentage of bees eaten is very low, and most of them were drones.

PHŒBE

SAYORNIS PHŒBE (*Latham*)

A. O. U. Number 456

OTHER NAMES.—Phœbe Bird; Pewee; Bridge Pewee; Water Pewee; Barn Pewee; Bean Bird; Pewit Flycatcher; Dusky Flycatcher.

GENERAL DESCRIPTION.—Length, 7 inches. Upper parts, grayish-olive; under parts, yellowish-white. Crown-feathers, erectile; tail, emarginate.

NEST AND EGGS.—Nest: Beneath barn eaves, bridges, culverts, ledges, in fact nearly anywhere that affords protection from the weather; constructed of mud, grass, vegetable fibers, lined with some hair, grass and feathers, and nearly always decorated exteriorly with green moss. Eggs: 3 to 8, normally 5, pure white, rarely speckled at large end with brownish.

DISTRIBUTION.—Eastern United States and more southern British Provinces; north to Maine, northern New York (Adirondack region), northwestern Ontario; Keewatin and southern Mackenzie; west, at least occasionally, to Athabasca (Little Slave Lake), eastern Wyoming, eastern Colorado, northeastern New Mexico, and western Texas; breeding southward to highlands of South Carolina, Louisiana, etc.; winters chiefly within the United States (mostly south of 37°) but migrating to Cuba and eastern and central Mexico; accidental in southern California.

In western North America this bird is replaced by Say's Phœbe and Black Phœbe.

THE Phœbe shares with the House Wren and the Robin the comforts and protection that may be found in living close about the house and barn. You may see it first some spring morning perched on the veranda railing, and a few weeks later watch the building of its nest on a plate-rail supporting the rafters of the veranda roof. Or again the nest may be in the barn or other outbuilding. It likes bridges also, and in the Northern States there is hardly a creek or ravine bridge without its pair of Phœbes. The "phoe-be" notes of this bird are not so sad as the cries of the Wood Pewee, which it much resembles and for which it may easily be mistaken. In fact, its call has a quality that seems to indicate resentment, as though the bird was cross and at outs with everybody it knows.

Courtesy of American Museum of Natural History

PHŒBE

When the four or five white eggs are hatched the Phœbe parents have a very busy time of it finding enough insects to satisfy their appetite for food. At first the mother covers them at night, but in a few days they grow so large that the nest is quite filled without her. Look at a Phœbe's nest some night with a light and see if you can catch the young ones asleep!

Wood Pewee

Myiochanes virens (*Linnæus*)

A. O. U. Number 461

Other Names.—Pewit; Pewee Flycatcher.

General Description.—Length, 6¼ inches. Upper parts, olive; lower parts, grayish-olive and yellowish-white. Tail, emarginate.

Nest and Eggs.—Nest: Usually saddled on the horizontal limb of a deciduous tree, in clearings or edge of deep woods, from 10 to 60 feet up; shallow, constructed of fine grasses, strips of bark, bits of vegetable or moss fibers, decorated exteriorly with lichens fastened with cobwebs, with thick felted sides and thin bottom; indistinguishable from a knot or branch. Eggs: 2 to 4, commonly 3, creamy white with a wreath of chestnut, warm brown, and lavender around large end.

Distribution.—North and South America; breeds from Manitoba, Ontario, southern Quebec, and Prince Edward Island to southern Texas and central Florida, west to eastern Nebraska; winters from Nicaragua to Colombia and Peru; casual in Colorado; accidental in migration in Cuba.

Replaced in western North America by the Western Wood Pewee.

This little flycatcher lives from choice where the trees are old and large. In the deep woods where the ferns grow underneath and the limbs meet overhead the Wood Pewee finds its ideal home. Here you may find it any summer-day quietly on watch for passing insects. Its favorite perch is on a dead twig or bare end of some drooping limb. So constantly does it sit in such places that many boys call it the "Dead Limb Bird."

WOOD PEWEE

From a drawing by R. I. Brasher

Its cry is one of the first notes of the morning, and all day long it mingles with the other sounds of the woodland. "Pe-wee-e, pe-wee-e!" with sweet plaintiveness it comes through the lights and shadows of the forest until evening has fallen.

The Wood Pewee lives also in the park, on the college campus, or in fact almost any place where large forest trees are found. Its nest is small and flat. It rests on a limb from fifteen to fifty feet from the ground, and is so well hidden that discovery is rare, except when watching the visits of one of the parent birds. It takes a sharp eye, indeed, to find a Wood Pewee sitting motionless on its nest perched on a limb forty feet from the earth.

HORNED LARK

OTOCORIS ALPESTRIS ALPESTRIS (*Linnæus*)

A. O. U. Number 474

OTHER NAMES.—Northern Horned Lark; Winter Horned Lark; Shore Lark; Prairie Bird; Road Trotter; Wheat Bird; Spring Bird; Life Bird.

GENERAL DESCRIPTION.—Length, 7¼ inches. Upper parts, pinkish-brown; under parts, white; a black crescent under each eye, and a third one on the breast.

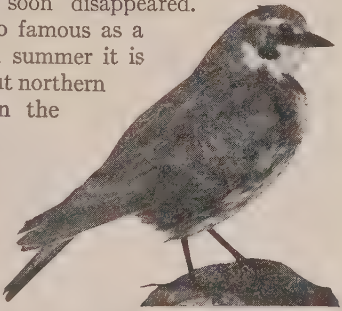
NEST AND EGGS.—Nest: On ground among moss or tuft of grass; constructed of grass and lined with finer blades and feathers. Eggs: 3 or 4, greenish-gray, thickly spotted with dark olive and pale lavender.

DISTRIBUTION.—Breeding in northeastern British America, east of Hudson Bay, from Newfoundland, Labrador, and head of James Bay northward; in winter migrating west to Manitoba and the Mississippi valley (eastern portion, chiefly) and southward to Illinois, Ohio, and the Carolinas, casually to Louisiana and the Bermudas; accidental in Greenland.

Fourteen varieties or sub-species of the Horned Lark are recognized in North America.

THE Skylark of Europe and Northern Africa is a songster whose reputation is worldwide. It has been introduced into this country several times, but all the birds liberated soon disappeared. Closely related to it, although not so famous as a singing bird, is the Horned Lark. In summer it is found in Newfoundland and throughout northern Canada, where its nest is placed on the ground, generally in open places.

In the United States we see the Horned Lark only in the winter. Even when the intense cold of the north drives it to take refuge in our warmer climate, it is rarely found farther south than the State of Georgia. The birds come to us in flocks of from a dozen to a hundred or more, and sometimes fly and feed with other northern birds, as for example, the Snowflake. These flocks frequent the region of the sea-coast, and especially in the southern half of their winter range are found inland. While feeding, they scatter about the field, walking along in a very pretty and dainty manner. In taking flight, the flock reunites; and, rising with clear, whistling notes, flies to a neighboring field to continue the search for food.


Courtesy of American Museum of Natural History

HORNED LARK

MAGPIE

PICA PICA HUDSONIA (*Sabine*)

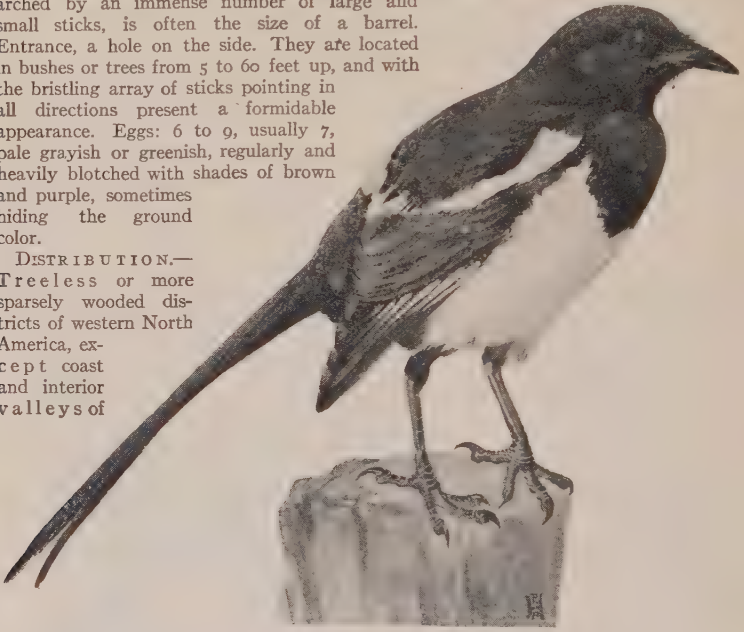
A. O. U. Number 475

OTHER NAMES.—American Magpie; Black-billed Magpie.

GENERAL DESCRIPTION.—Length, 19½ inches. Plumage, black with white on shoulders and abdomen. Tail, much longer than wing, graduated for ½ or more of its length; wing, short and rounded; feet, stout.

NEST AND EGGS.—Nest: The nest proper, a bowl of mud and grass, surrounded and arched by an immense number of large and small sticks, is often the size of a barrel. Entrance, a hole on the side. They are located in bushes or trees from 5 to 60 feet up, and with the bristling array of sticks pointing in all directions present a formidable appearance. Eggs: 6 to 9, usually 7, pale grayish or greenish, regularly and heavily blotched with shades of brown and purple, sometimes hiding the ground color.

DISTRIBUTION.—Treeless or more sparsely wooded districts of western North America, except coast and interior valleys of California; north to northwestern Alaska; south to southern Arizona, New Mexico (where breeding at 7,000 to 12,000 feet), and western Texas; east to western portion of the Great Plains, and to Lake Winnipeg; rare or casual winter visitant or straggler to southwest side of Hudson Bay, Ontario, Michigan, northeastern Illinois, Wisconsin, Minnesota, Iowa, eastern Nebraska, etc.



MAGPIE

FROM A DRAWING BY R. BRUCE HORSFALL

WHEN in 1804 the explorers Lewis and Clark ascended the Missouri River and traversed over our newly acquired Northwest country they discovered the American Magpie, the existence of which was at that time unknown. Their account describes these birds as "familiar and voracious." We are told that they penetrated the tents and snatched meat from the dishes. While the hunters were dressing their game the Magpies would seize the meat hanging within two feet of the men.

This, the largest of all our Jays, is a familiar figure in western United States and Canada. In the fields and along roads in the open country one may see them flying low and rather heavily from one clump of trees to another. Near Burns, Oregon, I counted thirty-one of these great long-tailed birds in a flock. Such numbers seen at one time, it may be added, is an unusual sight.

The nest is built in low trees and is a large affair. One the writer examined in northern California was at least two feet in diameter. It was made of a great collection of thorny twigs. The cup for the eggs was lined with grass and was situated in the center of the nest entirely concealed from view by the dome of twigs above.

Magpies are unpopular with stockmen and ranchers, who accuse them of attacking sick or wounded animals in a most savage fashion. In addition to the common Magpie of the West there is another species known as the Yellow-billed Magpie of California.

BLUE JAY

CYANOCITTA CRISTATA CRISTATA (*Linnæus*)

A. O. U. Number 477

OTHER NAMES.—Corn Thief; Nest Robber; Blue Coat; Jay; Common Jay.

GENERAL DESCRIPTION.—Length, 11½ inches. Upper parts grayish violet-blue; under parts, gray and white. Head, conspicuously crested; wings and tail, about equal in length, and rounded.

NEST AND EGGS.—Nest: Located in conifers or deciduous trees, preferably the former, particularly cedars; a loose, carelessly constructed affair, with ragged rim, though some are fairly well made of sticks, leaves, bark strips, weed stems, lined with strips of bark, grass, pine-needles, rags, paper, string or any material that seizes the bird's fancy. Eggs: 3 to 6, pale dull olive, greenish-olive, or dull buffy, spotted or blotched with dark olive-brown; one brood only.

DISTRIBUTION.—Temperate eastern North America, except peninsula of Florida; north on Atlantic coast to Nova Scotia, Prince Edward Island, New Brunswick (resident), etc., in the interior to about latitude 52°, casually 56°; west to eastern Assiniboia, eastern North and South Dakota, eastern half of Nebraska, eastern two-thirds of Kansas, eastern Oklahoma, and eastern half (approximately) of Texas; south to the Gulf coast. Replaced in Florida by the Florida Blue Jay.

A MOST noisy, happy-go-lucky bird is the Blue Jay. In bands of from six to fifteen or twenty, he and his friends travel through the tree-tops, from one grove to another. As they go they eat beech nuts, acorns and other food that pleases their taste. Their shouts of "jay, jay!" can be heard far across the fields on a calm day. It is a sad fact to relate, but it is true, that this beautiful blue and white creature at times eats the eggs and young of other birds.

There is one period of the year when the Jays are very quiet. That is when they have their own nest to guard. Being the enemy of so many birds, they appear to trust no one. They approach and leave their nests with the greatest stealth, and never think of shouting "jay!" when near their own precious eggs.

Jays delight in teasing other birds. The Screech Owl, found asleep on some sheltered leafy limb, is the signal for all the Jays of the neighborhood quickly to assemble and mob him. How they do shout and fly at him as if to strike him with their bills! Sooner or later the poor Owl must fly away and hide in some hole. If it did not, the Jays would perhaps tease it until nightfall.

CROW

CORVUS BRACHYRHYNCHOS BRACHYRHYNCHOS *Brehm*

A. O. U. Number 488

OTHER NAMES.—American Crow; Common Crow; Carrion Crow.

GENERAL DESCRIPTION.—Length, 19¾ inches. Plumage, black. Wing, long and pointed; tail, much shorter than wing; bill, compressed and higher than broad; feet, stout.

NEST AND EGGS.—Nest: Usually at good height in conifers and other trees, sometimes 75 feet from ground; a well-made, but coarse, structure of sticks, twigs, grasses, tree bark, very often thickly and evenly lined with soft inner bark of chestnut, basswood, or other dead trees, giving the interior a warm, yellowish-brown color; fine roots, straw, wool, or hair are also used for linings. Eggs: 4 to 8, from pale bluish-green to olive-green or greenish-buff, irregularly spotted and blotched with brown and olive-gray.

DISTRIBUTION.—Temperate eastern North America, except peninsula of Florida; north on Atlantic coast to Newfoundland and Magdalen Islands (southern Labrador?), on west side of Hudson Bay to Nelson River, and in the interior nearly to the Arctic coast; west to the beginning of the arid region. Replaced in Florida peninsula by the Florida Crow, and in western North America by the Western Crow.

THE Crow is the smartest bird in North America. There is no law that protects him, and it is hard to find a farmer who does not shoot a Crow when he gets a chance. The old black bird has few friends. Still, his numbers do not seem to decrease. He can take care of himself so well that with all the world against him, he thrives and increases.

A crow will pull up sprouting corn in fields, steal hens' eggs, dig holes in watermelons, and engage in many other tricks that have caused him to be unpopular. So much complaint arose regarding his bad habits, our Government decided to take up the matter of finding out all about it, and of seeing just what he does eat. Trained naturalists carefully investigated over a period of years, and then to the surprise of almost everybody they reported that this bird was not as bad as had been thought. He eats many grubs and insects, and on the whole does much more good than harm.

When taken young, Crows are sometimes tamed and become most amusing pets. These birds breed in the early spring, and hide their nests in high trees.

BOBOLINK

DOLICHONYX ORYZIVORUS (*Linnæus*)

A. O. U. Number 494

OTHER NAMES.—Skunk Blackbird; Skunk-head Blackbird; White-winged Blackbird; Meadowwink; Towhee (mistake); Rice-bird; May-bird; Reedbird; Butter-bird (Jamaica, B. W. I.); Meadow-bird; American Ortolan; Bob-lincoln; Robert.

GENERAL DESCRIPTION.—Length, 7 inches. Males in the spring and summer have the upper parts black and white and the lower parts black; males in the fall and winter and females all the year have the upper parts buffy-olive streaked with black, and the lower parts, pale buffy-olive. Wings, long and pointed; tail, shorter than wing with stiff, acute feathers; bill, conical and sharp.

NEST AND EGGS.—Nest: Wonderfully concealed in a depression of ground in meadows; constructed of dried leaves, weed stems, coarse grass, and lined with finer grasses. Eggs: 4 to 7, pale drab, pear-gray or pale rufous, irregularly splashed and spotted with erratic lines and marks of umber, chestnut, lavender, and deep purple.

DISTRIBUTION.—Eastern and central temperate North America; breeding from Pennsylvania, northwestern West Virginia, central Ohio, central Indiana, northern Illinois, southern Iowa, South Dakota, and Utah, northward to provinces of Quebec, Ontario, Manitoba, Assiniboia, and British Columbia (both sides of Cascade range), to about 40° on the Atlantic coast and 52° in the interior; west to Utah, northeastern Nevada, Idaho, and southeastern British Columbia; during migration southward through the West Indies, and the Atlantic coast of Central America to South America; also to the Galapagos Archipelago and the Bermudas.

IN early summer the Bobolink takes possession of the northern meadows. The male with his striking black, white and yellow plumage is sure to be in evidence if you come any place near him. His loud rollicking music comes to you from many quarters. Down on the ground, hidden securely in the grass, sits his plain colored mate, brooding her eggs, and no doubt enjoying the music quite as well as anyone.

Before the summer is over the Bobolink and his family leave their meadow home. True to the habits of the Blackbird group, of which he is a member, he gathers with hundreds of others of his kind and moves to the wild-rice marshes of the coast country. He has now lost his bright spring plumage and closely resembles the female and young.

In Delaware, Maryland, and northern Virginia, where the birds are often shot for food, they are known as "Reed-birds." A little farther south the migrating flocks reach the rice-fields. Here they are called "Rice-birds." Continuing southward, the Bobolinks journey on to the land of central South America, there to remain until the approaching spring in their northern home again calls them on the long return journey.

COWBIRD

MOLOTHRUS ATER ATER (*Boddaert*)

A. O. U. Number 495

OTHER NAMES.—Cow Blackbird; Cow Bunting; Lazy Bird; Brown-headed Blackbird; Cuckold; Cow-pen Bird; Buffalo Bird; Brown-headed Oriole.

GENERAL DESCRIPTION.—Length, 8 inches. Males are greenish-black with brown fore parts; females are brownish-gray. Bill, shorter than head, conical, and compressed; wings, moderately long and pointed; tail, about $^2/_3$ length of wing, even or slightly rounded.

NEST AND EGGS.—A noted parasite, depositing its eggs, usually singly, in nests of smaller birds, but as many as five have been found in one nest; number of eggs unknown and the circumstances of deposition render a correct conclusion impossible. Eggs are white, spotted and blotched pretty generally over entire surface with chestnut and burnt-umber.

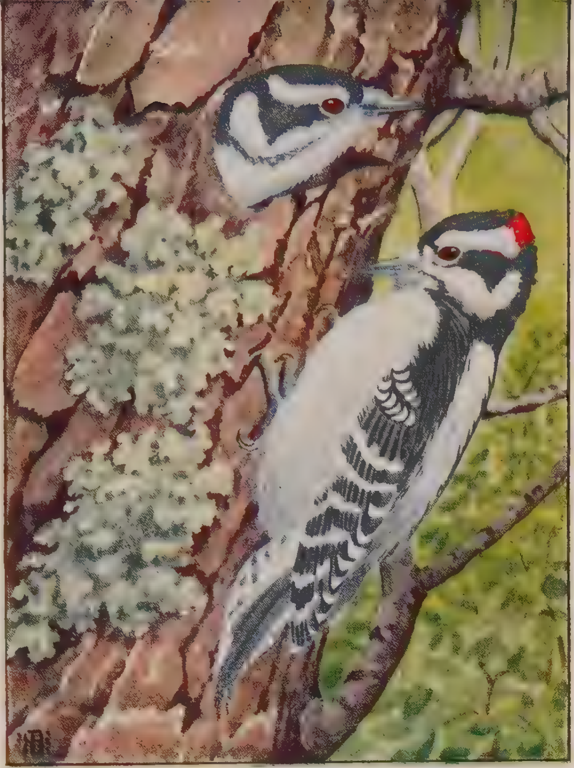
DISTRIBUTION.—Temperate North America in general, except portions of Pacific coast; north to about 49° in more eastern portions, to 55° 30′ in the interior; west to British Columbia, Washington, Oregon, Nevada, and southeastern California; south in winter to central and southeastern Mexico; breeding south to Georgia, Louisiana, and Texas.

Courtesy of American Museum of Natural History

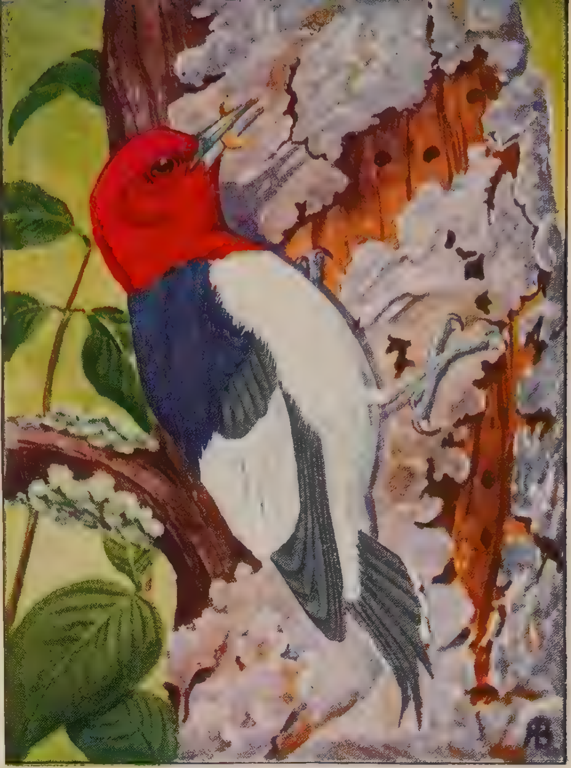
COWBIRD

THIS is the "black sheep" of the bird-world. The Cowbird possesses none of the charming manners we so much admire in bird-life generally. The male has no song, but a series of gurgling notes that are without beauty of sound or interest. They do not mate like other birds, but stay in companies and wander about through the fields and woods. The females do not have nests, but during the spring slip away from their companions, one at a time, to lay their eggs in the nests of other and smaller birds.

The young when hatched are larger than the rightful bird babies of the nest, and by reaching farther and begging louder are able to get most of the food that the old birds bring. This causes them to grow so fast that they are soon able to crowd the other young out of the nest. For a long time they follow their foster-parents about, and beg for food after they are twice the size of the poor little Warbler, or perhaps Song Sparrow mother that has hatched them. While seeking their food, Cowbirds are often found with cattle, and appear to catch insects that fly about the cows' legs.

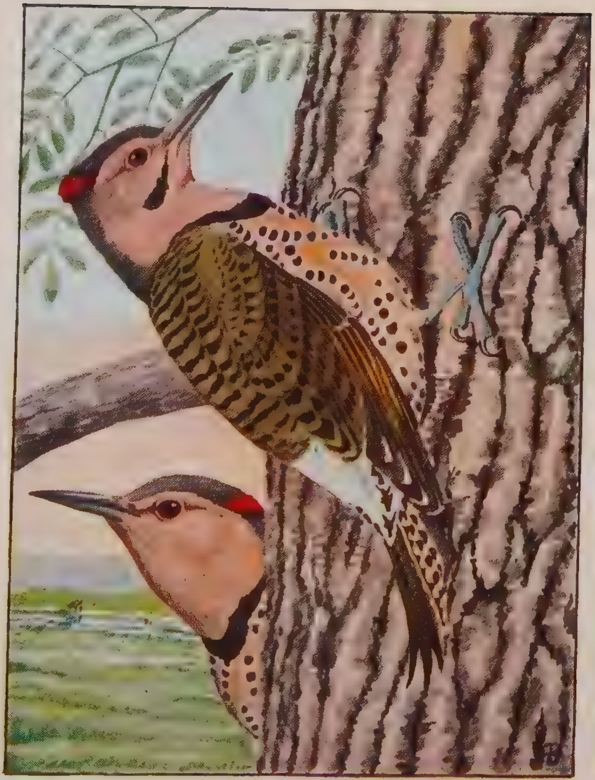


DOWNY WOODPECKER (1/2 nat. size)

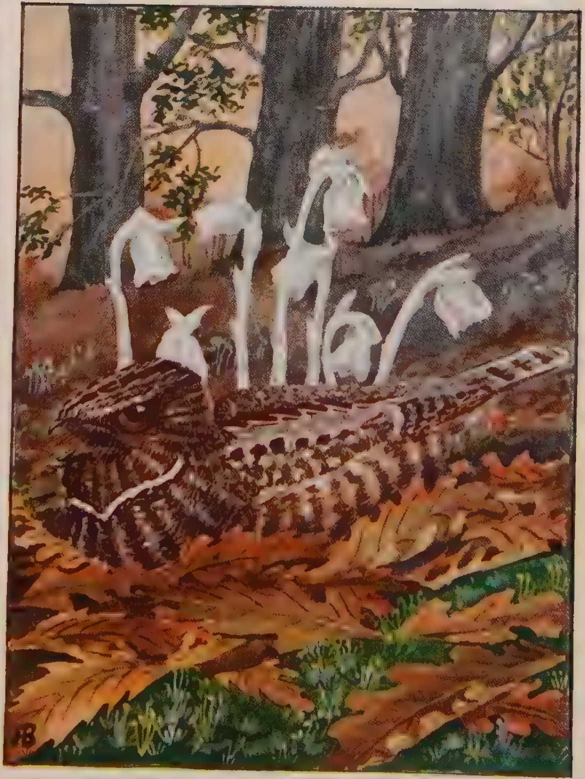


RED-HEADED WOODPECKER (7/16 nat. size)

FROM DRAWINGS BY R. I. BRASHER

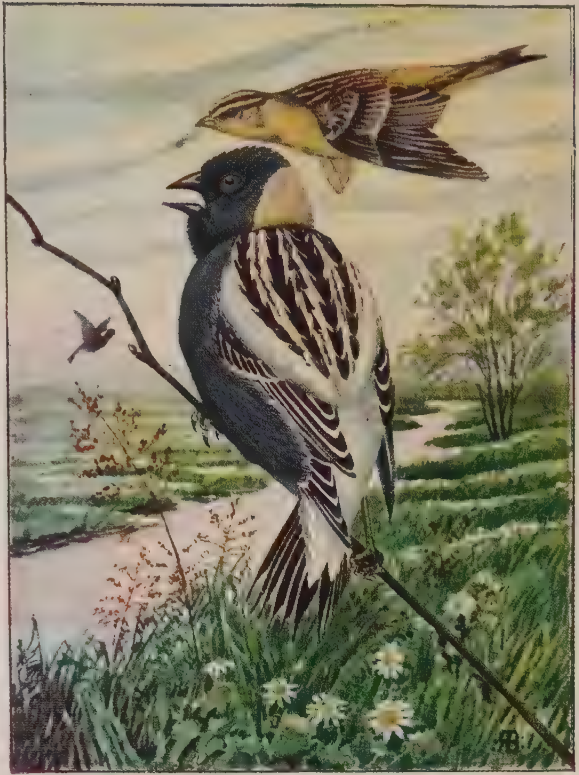


FLICKER (3/8 nat. size)

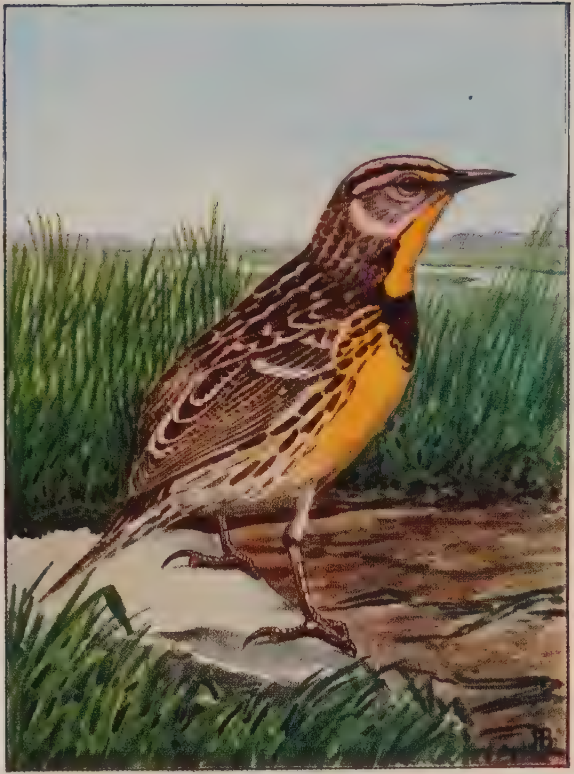


WHIP-POOR-WILL (3/10 nat. size)

FROM DRAWINGS BY R. I. BRASHER

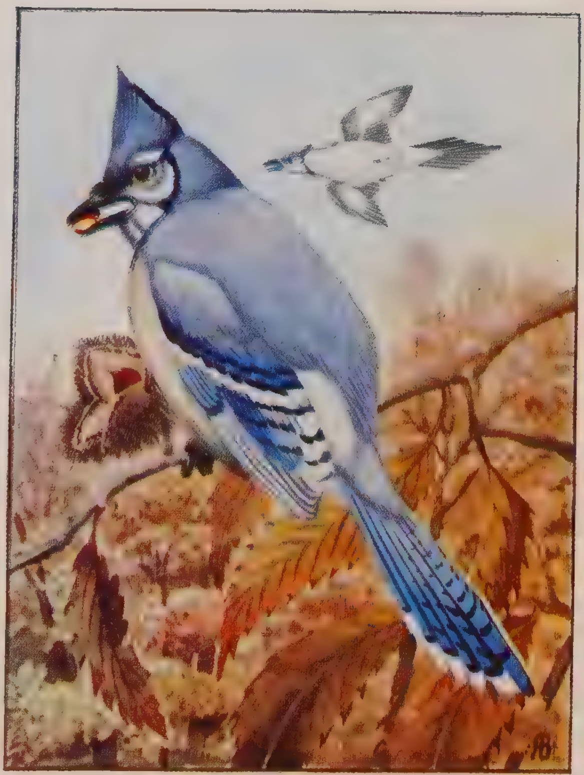


BOBOLINK (1/2 nat. size)

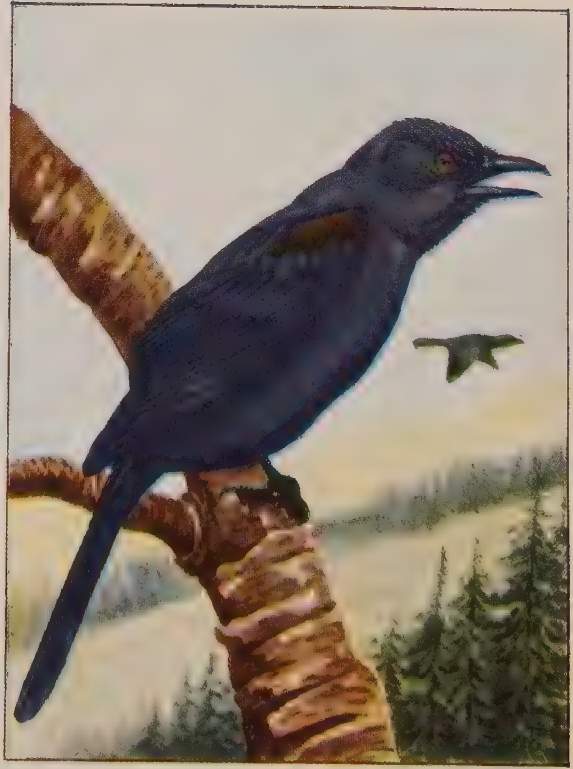


MEADOWLARK (3/10 nat. size)

FROM DRAWINGS BY R. I. BRASHER



BLUE JAY (3/10 nat. size)



CROW (1/6 nat. size)

FROM DRAWINGS BY R. I. BRASHER

RED-WINGED BLACKBIRD

AGELAIUS PHŒNICEUS PHŒNICEUS (*Linnæus*)

OTHER NAMES.—Swamp Blackbird; Red-winged Starling; Red-shouldered Starling; Red-shouldered Blackbird; Marsh Blackbird; Red-winged Oriole; Red-wing.

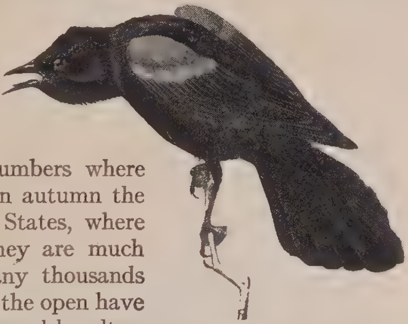
GENERAL DESCRIPTION.—Length, 8½ inches. Males are black with red shoulders; females are dusky above and whitish below with streaks of dusky. Bill, shorter than head; wings, rather long and pointed; tail, ¾ or more as long as wing, and rounded.

NEST AND EGGS.—Nest: In bushes or small trees, but usually in reeds which are interwoven between the outside layer of sedge-grass of which the nest is composed; sometimes in the center of a tussock close to the ground, but usually two or three feet above it, and always in swampy places. Eggs: 3 to 6, usually 5, pale bluish or greenish-white, marked with pen lines of sepia or dark reddish-brown, arranged in a wreath around large end or scattered over entire surface.

DISTRIBUTION.—Eastern United States and more southern British Provinces to about latitude 62°, except Florida and Gulf coast; west to eastern base of Rocky Mountains.

Other varieties of the Red-winged Blackbird extend the range over all of United States and southern Canada.

IN REALITY the name of this bird does not describe it very accurately. The black male has a red patch of feathers on its "shoulders" or wing-coverts, but the whole wing is not red. The female is a smaller, plainly streaked bird. In the nesting season these are inhabitants of the marshes, and even afterward they frequent such regions in large numbers where they feed on wild rice. Early in autumn the flocks depart for the Southern States, where they pass the winter. Here they are much seen in the upland fields. Many thousands congregate, and when feeding in the open have the peculiar habit of moving forward by alternately flying and walking. Those at the rear continually rise and fly over their feeding companions only to light in front of them. At a distance the flock presents much the appearance of a black feathered hoop slowly rolling across the field.



RED-WINGED BLACKBIRD
FROM A DRAWING BY
R. I. BRASHER

There is always much life about a nesting colony of Redwings, much calling and chattering, and through it all over and over all day long there rings the "King-quer-ree!" the song of the handsome males. In the nest hung among the rushes you may find four or five pale blue eggs streaked and scratched with black markings, as if the mother bird had come home some day with fresh ink upon her toes.

Meadowlark

Sturnella magna magna (*Linnæus*)

A. O. U. Number 501

Other Names.—Common Lark; Old Field Lark; Field Lark; Marsh Quail; Medlark· Mudlark; Medlar; Crescent Stare.

General Description.—Length, 10½ inches. Upper parts, brown streaked with black; under parts, black and yellow. Bill, long and slender; wings moderately short; tail, short, with the feathers pointed; legs and toes, long.

Nest and Eggs.—Nest: Artfully concealed beneath tuft of clover, sedge or grass; constructed of stems and coarse grass, and lined with fine blades; usually with covered, arched entrance to which a short winding path leads. Eggs: 4 to 6, crystal white, thickly or thinly spotted with chestnut and reddish-brown; a second nesting not uncommon and probably usual.

Distribution.—Eastern United States and British provinces north to 54° and as far west as Great Plains. Not strictly migratory, often wintering as far north as lower New England States. Replaced in Arizona, southern New Mexico, and southern Texas by the Rio Grande Meadowlark; in southeastern United States from southern Illinois, southwestern Indiana, and North Carolina to the Gulf coast by the Southern Meadowlark; and in western North America by the Western Meadowlark.

The clear, undulating song of the Meadowlark gives much added beauty to the farm-lands. Going toward the spot whence the sounds come, you will find the singer standing on a fence post, stump, or low tree, his bright yellow breast making a shining mark in the sunshine. Upon too near approach he flies to the ground, and although the place where he alights may be in the open, he at once disappears. This is because his yellow breast is no longer visible, and as he walks away the black-streaked plumage of his head, neck, and tail so closely blend with the surroundings that it is hard to detect him. This is one of Nature's ways of protecting ground living birds, for let a Hawk fly over and Mr. Meadowlark squats close to the earth, and the winged death passes on. In days gone by these birds were much shot for food in the Southern States, where they are very numerous, especially during the colder months of the year, but now the bird is protected by law.

The Meadowlark's nest is hidden in the grass of pastures and fields, or in the open pine woods. Among its enemies may be mentioned Hawks, Foxes, Skunks, Opossums, and Snakes. In the Western States, the Western Meadowlark has even a more beautiful song than the Eastern bird, and gives much pleasure to children about the lonely ranch houses.

BALTIMORE ORIOLE

ICTERUS GALBULA (*Linnæus*)

A. O. U. Number 507

OTHER NAMES.—Golden Robin; English Robin; Hang-bird; Hang-nest; Fire-bird; Pea-bird; Hammock-bird; Golden Oriole; Baltimore Bird.

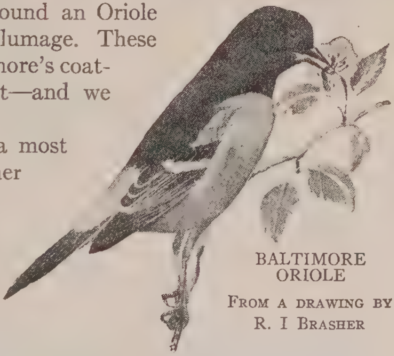
GENERAL DESCRIPTION.—Length, 8 inches. Fore and upper parts, black; under parts, orange. Bill, long and pointed; wings, moderately long; tail more than ¾ length of wing.

NEST AND EGGS.—Nest: A remarkable example of bird craftsmanship. Suspension strings are first firmly tied to the branches, these forming the warp through which the plant fibers, milk-weed stalks, gray strips of bark, horse-hair, or cord, are deftly woven. The completed structure is gourd-shaped, flaring at bottom and always gray-colored. Extreme ends of large elms are oftenest selected for the site, but nests are found on a large variety of trees, even the conifers. The perfection of their workmanship is proved by the fact that these homes sometimes endure the blasts of four winters. Eggs: From 5 to 6, white with characteristic pen lines, scrawls, and spots of dark brown and black of the species.

DISTRIBUTION.—Eastern temperate North America; breeding from more southern United States (Texas to the Carolinas), except along the Gulf coast, northward to Nova Scotia, southern New Brunswick, Ontario, and Manitoba (to latitude 55°); west to eastern Assiniboia, Montana, Wyoming, and Colorado, east of the Rocky Mountains; in winter south through eastern Mexico and Central America to Colombia and Venezuela; accidental in Cuba.

IN THE year 1632 the King of England granted to an Irish peer, Lord Baltimore, a charter to found a colony in Maryland. The people who came to live in his settlement found an Oriole that was black and yellow in plumage. These were the two colors on Lord Baltimore's coat-of-arms, so the settlers called it—and we still call it—the Baltimore Oriole.

The female of this species is a most wonderful weaver. She builds her nest of grass, hair, strings, and strips of bark well out on the end of a long drooping limb. It is a hanging nest, and with her sharp bill the mother sews its walls through and through and round and round with the long grass-blades or strings she uses. Of all cradles that rock when the wind blows, there is none that swings and dips like the Oriole's hammock nest.



BALTIMORE ORIOLE

FROM A DRAWING BY R. I BRASHER

These birds are fond of orchards, and especially frequent the shade trees bordering country roads and quiet village streets. Sometimes people hang up bright-colored yarns where these birds can get them, which results in having a very bright-colored nest built in their yard.

Orioles consume many harmful insects, and feed their young with untold numbers of caterpillars, which makes them very valuable allies of the farmer.

PURPLE GRACKLE

QUISCALUS QUISCULA QUISCULA (*Linnæus*)

A. O. U. Number 511

OTHER NAMES.—Blackbird; Crow Blackbird; New England Jackdaw; Maize Thief; Keel-tailed Grackle; Purple Jackdaw.

GENERAL DESCRIPTION.—Length, 12½ inches. Plumage, black with metallic hues. Bill, about as long as head and decurved at tip; tail, long and graduated. The tail is plicate, or capable of being folded vertically, so that a transverse section is V-shaped, the two edges being brought near together when flying; because of this folding and the graduated form of the tip, the effect when the bird is flying is very peculiar, the tail appearing as if much longer on one side than on the other.

NEST AND EGGS.—Nest: Built preferably in a conifer, placed on a bough but often in fork formed by topmost whorl of branches; sometimes in hollows or cavities of trees near water; a loose, bulky structure of twigs, hay, and grains, frequently cemented with mud. From Kent, Conn., comes the report of the finding of the nest of this bird in the rushes of a marsh, a very unusual site. Eggs: 4 to 6, greatly varying in size and color; ground color greenish-blue to dirty brown, strongly marked with blotches and zigzag streaks or lines of brown and black.

PURPLE GRACKLE

FROM A DRAWING BY R. I. BRASHER

DISTRIBUTION—Atlantic coast district of United States, east of Alleghenies; north to lower Hudson valley and northern shore of Long Island Sound; breeding south to uplands of Alabama, Georgia, and the Carolinas, to Virginia (?) along the coast; occasional on western side of Alleghenies, in eastern Tennessee; winters mainly south of the Delaware valley. Replaced in the coastal plain from South Carolina to Florida and west to Texas by the Florida Grackle, and in central and northeastern North America by the Bronzed Grackle.

AMONG the first birds of spring to arrive in the North are the black, shiny Purple Grackles. They come in droves, and their harsh notes are heard as they fly low over the trees or feed in the fields. At times they will walk about on the lawn or in the garden.

In colonies of from six to a dozen or more they come together when the nesting period approaches. In some groves, often of pines, they build their nests of sticks and grass. Now and then a nest is made in the natural hollow of a tree, or even in an unused Flicker's nest. The eggs are four to six in number. In color they are pale bluish, and are scratched and spotted with black and brown.

No song comes from the Grackle's throat, and he shows little of the emotions that other birds display. Approach the nest, and the parents exhibit some resentment, it is true, but it is harsh and threatening, rather than pleading in character.

After the breeding season the old flock life is renewed, and bands of Grackles wander about the country, apparently in a more or less aimless manner. They assemble in large numbers to pass the night. Such roosts are often occupied for weeks at a time. Groves and shade trees in villages or along quiet streets are often used for this purpose.

PURPLE FINCH

CARPODACUS PURPUREUS PURPUREUS (*Gmelin*)

A. O. U. Number 517

OTHER NAMES.—Purple Linnet; Purple Grosbeak; Red Linnet; Gray Linnet (immature and female).

GENERAL DESCRIPTION.—Length, 6¼ inches. Male, pinkish-purple and brown; female, olive-grayish above, and white below, conspicuously streaked above and below. Bill, shorter than head, conical, and thick; tail, about ¾ length of wing, deeply emarginate.

NEST AND EGGS.—Nest: Usually placed in conifers; a frail open-work structure of grass rootlets, bark strips, vegetable fibers, thickly lined with hair; resembles a Chipping Sparrow's nest, but larger. Eggs: 4 to 6, dull greenish-blue, spotted with shades of brown, black, and lilac.

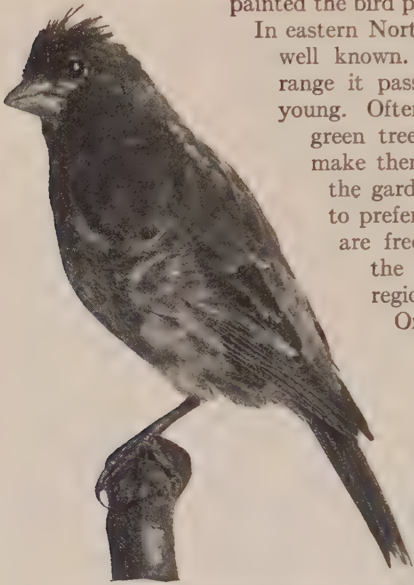
DISTRIBUTION.—Eastern North America; breeding from Pennsylvania (especially in mountains), northern New Jersey, Connecticut, southern Ontario, northern Illinois, Minnesota, and North Dakota, north to more eastern British provinces, Hudson Bay, Manitoba; in winter south to Gulf coast.

THE Purple Finch is not at all purple; the male is of an old-rose color, and the female has the general sparrow-like appearance found in several of our birds where the males are brightly colored. A long time ago the bird was named from a painting that some one made of it This manner of naming the bird would probably have been all right had not the artist painted the bird purple instead of its true color.

In eastern North America the Purple Finch is well known. In the northern part of its range it passes the summer and rears its young. Often the nests are built in evergreen trees on the lawn, and the birds make themselves very much at home in the garden. While many of them seem to prefer to live near the house, others are frequently contented to dwell in the wildest and most uninhabited regions of the mountains.

On the whole, the bird is very much liked, yet many people would prefer that it did not have such a strong liking for the buds and blossoms of fruit trees.

Purple Finches winter in the Southern States, where they wander about in flocks, and seldom display for long a liking for any one neighborhood.



Courtesy of American Museum of Natural History

PURPLE FINCH

CROSSBILL

LOXIA CURVIROSTRA MINOR (*Brehm*)

A. O. U. Number 521

OTHER NAMES.—American Crossbill; Red Crossbill; Common Crossbill.

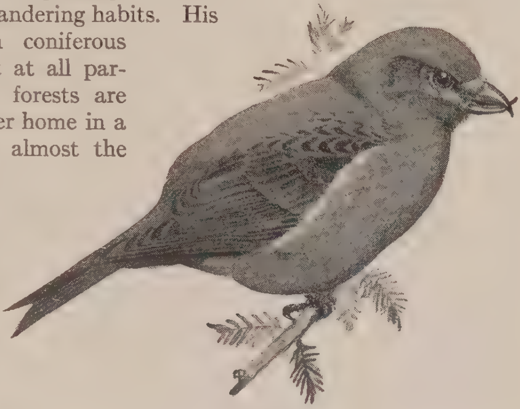
GENERAL DESCRIPTION.—Length, 6 inches. Male, dull red; female, grayish-olive. Bill, with the tips crossed in adults; wings, long and pointed; tail, short, narrow, and deeply forked.

NEST AND EGGS.—Nest: Placed like the White-winged Crossbill's, in conifers, usually within 20 feet of the ground; outside "wall" constructed of evergreen twigs, shreds of bark, rootlets with a thick lining of moss, leaves, grass, cottony fibers well felted together, and generally some green bits of hemlock or cedar tips. Eggs: 3 to 4, pale greenish, specked and spotted with shades of brown and purplish gray.

DISTRIBUTION.—Northern and eastern North America, breeding in coniferous forest districts from southern Alleghenies in northern Georgia (sporadically toward coast in Maryland, Virginia, etc.), Michigan, etc., to Nova Scotia, to Fort Anderson in the interior, and to western Alaska, and southward through Pacific coast district to western

Oregon: in winter irregularly southward to South Carolina (vicinity of Charlston), Louisiana, Nevada, etc: casually to the Bermudas.

THE Crossbill is the tramp among birds. This is not meant to suggest that he presents a ragged appearance, for he is quite a neat and handsome bird in his dull red plumage. Reference is made to his wandering habits. His natural home is in coniferous forests, but he is not at all particular where these forests are situated. His summer home in a general way is over almost the whole of Canada and along the tops of the southern mountains to Georgia. In flocks they go from one feeding ground to another. Sometimes they will remain in a given section for several weeks, and again will stay for only a day or two.



CROSSBILL
FROM A DRAWING BY R. I BRASHER

The American Crossbill has a short call-note in the form of a low whistle that is often heard as the birds feed. Much of their food consists of the seeds of the pine. Their bills are sharply crossed near the tips, which enable them very easily to pry apart the scales of the pine cones.

In winter these birds wander southward, and may possibly appear in almost any neighborhood in the United States. However, their coming and going is so erratic that there are many prominent bird students in the country who have never yet been so fortunate as to see one alive.

GOLDFINCH

ASTRAGALINUS TRISTIS TRISTIS (*Linnæus*)

A. O. U. Number 529

OTHER NAMES.—Yellow-bird; Thistle Bird; Wild Canary; Catnip Bird; Lettuce-bird; Shiner; Salad-bird; Beet Bird; American Goldfinch.

GENERAL DESCRIPTION.—Length, 5 inches. Male in summer has the body lemon-yellow and the wings and tail black; male in winter and female at all seasons have the upper parts olive-brownish and the under parts grayish-white with the wings and tail blackish. Bill, small, conical, and acute; wings, long and pointed; tail, rather short and forked; legs, short.

Nest and Eggs.—Nest: Placed in forks of bush or sapling, sometimes on the swaying stalk of a wild blackberry, usually within 5 feet but sometimes 30 feet from the ground; a compact, artistic structure of felted plant-down, mosses, grass, leaves, bark strips, usually lined with thistledown; build later than any other birds, from last week in June to second week in September; sometimes reconstruct old Blackbird or other nests, the added material being principally a heavy lining of down. Eggs: 3 to 6, sets of 5 and 6 being common, pale bluish white, unmarked.

Distribution.—United States and more southern British provinces east of Rocky Mountains, north to Manitoba, Ontario, Quebec, southern Labrador, and Newfoundland, breeding southward to the middle districts of the United States; wintering southward to Gulf coast. Replaced in the Rocky Mountain plateau by the Pale Goldfinch, and in the Pacific coast region by the Willow Goldfinch.

In the spring, when the dandelion blossoms are turning into white puffy balls by the roadside, a small flock of birds will be discovered feeding on them. Many of these are brilliant yellow with black on the wings, crown, and tail. These are Goldfinches, and the more brightly colored ones are the males, which at this time are very brave and handsome in their new spring suits. Late in the summer, when in your garden the sunflower seeds are ripe, you are pretty sure to have a visit from the cheerful twittering Goldfinch. Generally they come and go in small companies. Only during the nesting period do they stay in pairs.

Like the Cedar Waxwing, these birds breed late in the season. Usually it is late in June or July before a search for one of their nests will be successful. When found, often by watching the birds carrying food for their young, it is usually in a low bush, or perhaps an orchard tree. The nest is a very compact one. It is made of grass and plant-down, and altogether must form a very soft and comfortable cradle for the four or five bird babies that will soon be lying in it.

Goldfinches eat a wide variety of seeds and insects. In winter they range all over eastern and central United States, and are always very interesting and attractive birds.

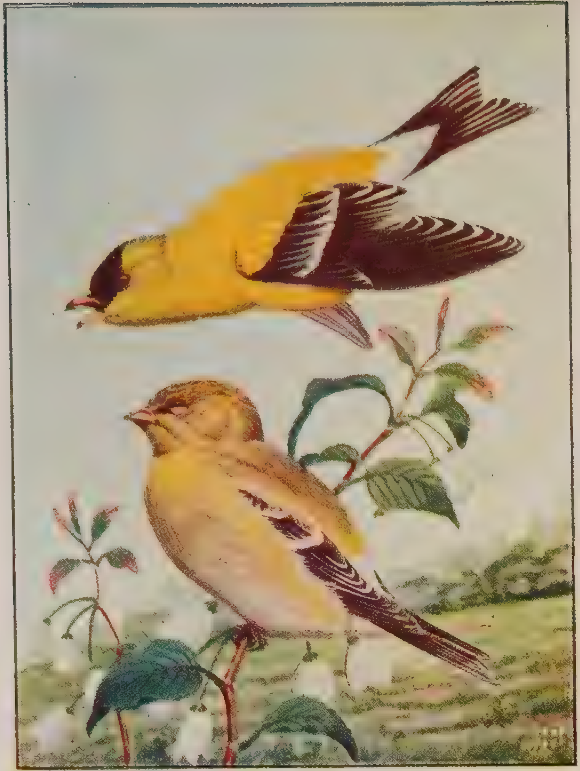
English Sparrow

Passer domesticus domesticus (*Linnæus*)

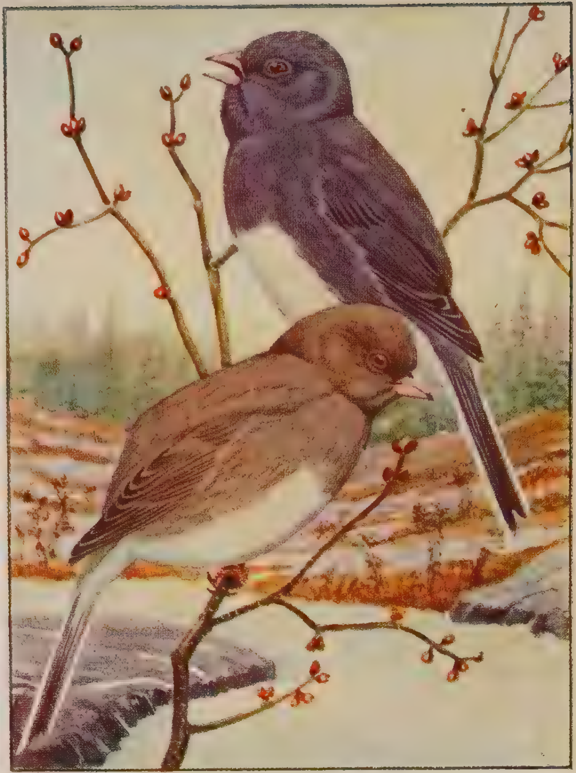
Other Names.—European House Sparrow; Gamin; Tramp; Hoodlum; Domestic Sparrow.

General Description.—Length, 5¾ inches. Upper parts, reddish-brown, streaked with black; under parts, grayish-white. Bill, stout, shorter than head; wings, of medium length; tail, about ¾ length of wings; legs, short and rather stout.

Nest and Eggs.—Nest: Occasionally built in trees, more often in bird-houses, electric-light hoods, cornices, water-spouts, and similar places; tree-nests large and covered, others open; made of grasses or any easily obtained material, loosely put together, and lined with feathers. Eggs: 4 to 7, generally white, finely and evenly marked with olive, but also varying from plain white to almost uniform olive brown; two broods at least in a season, usually three, and sometimes four and even five.

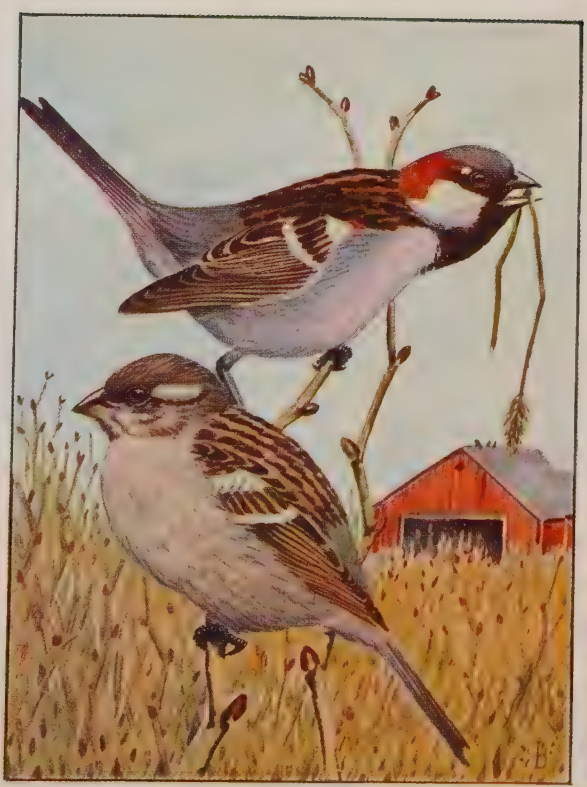


GOLDFINCH (1/2 nat. size)

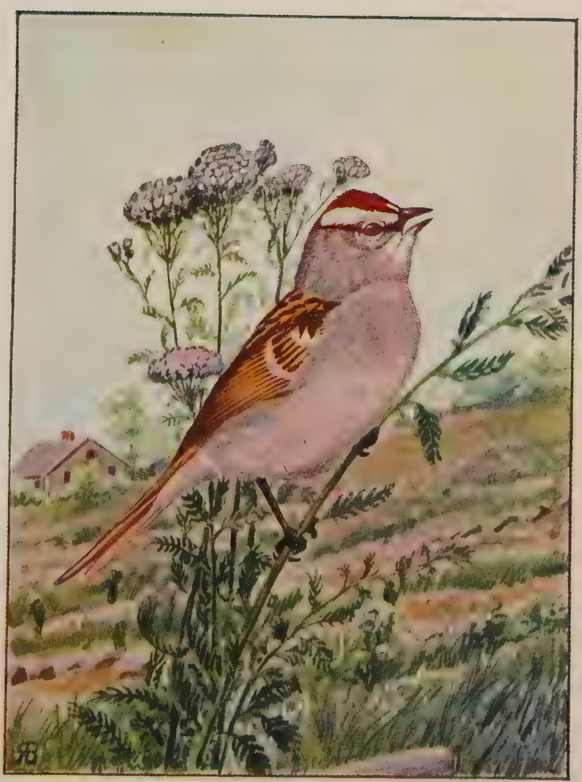


JUNCO (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

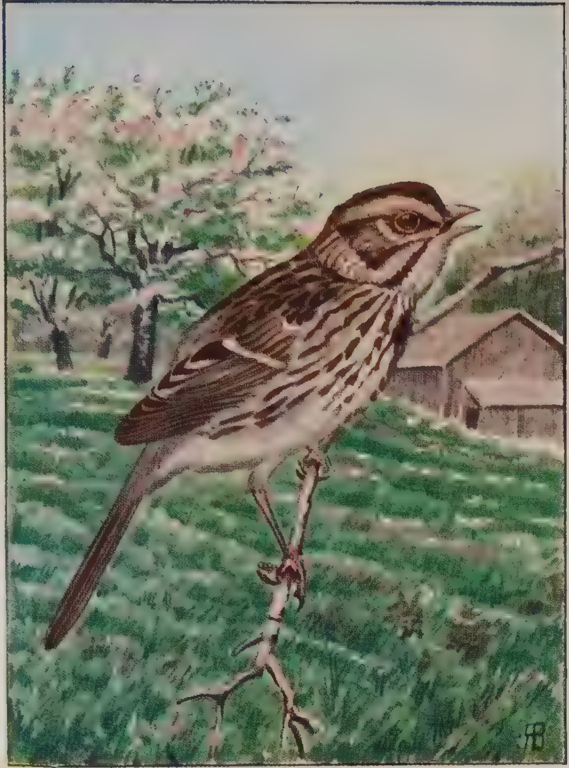


ENGLISH SPARROW (1/2 nat. size)

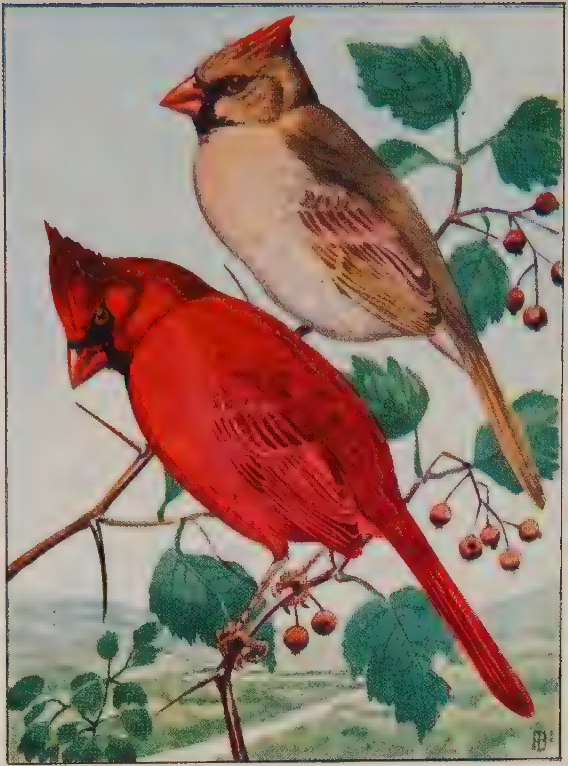


CHIPPING SPARROW (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

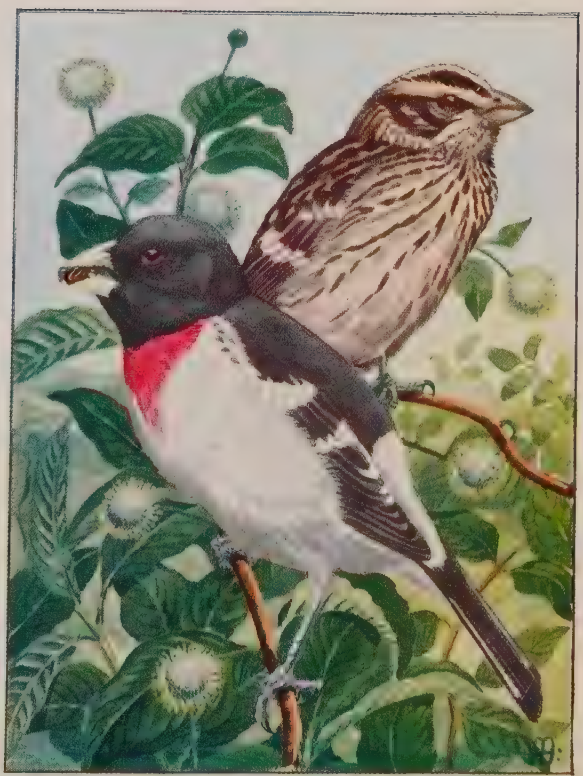


SONG SPARROW (1/2 nat. size)

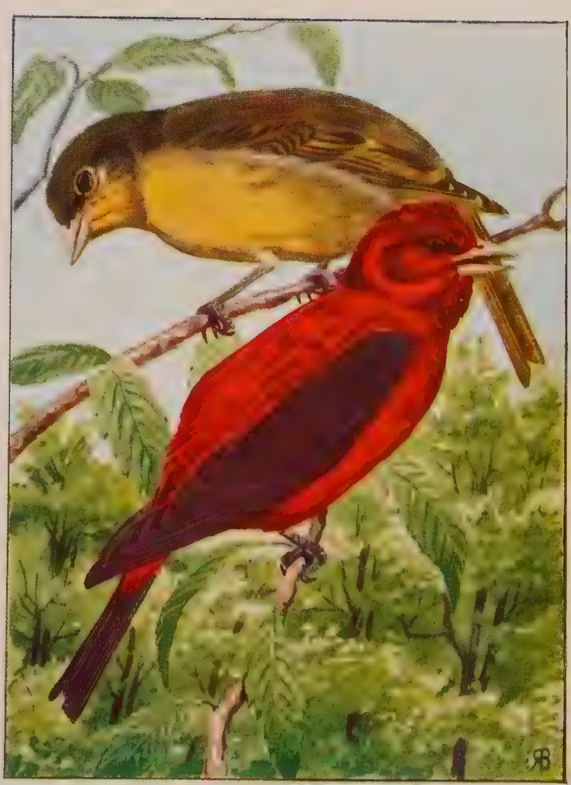


CARDINAL (3/8 nat. size)

FROM DRAWINGS BY R. I. BRASHER



ROSE-BREASTED GROSBEAK (1/2 nat. size)



SCARLET TANAGER (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

Distribution.—Europe in general, except Italy; introduced into the United States, where thoroughly and ineradicably naturalized in all settled districts, except southern Florida and a few other extreme outposts; also introduced into Bahamas (island of New Providence), Cuba, Nova Scotia, Bermudas, and southern Greenland.

Almost every variety of small wild bird found commonly in western Europe has been brought to the United States and liberated with the hope that it would live here and increase in numbers. All such birds have perished, however, except the Starling and House Sparrow, or "English Sparrow," as we call it. The first English Sparrows were brought to this country in the year 1850 and given their freedom in Brooklyn, New York. Many other shipments followed. The Sparrows did well, and are now common birds in almost all localities in the United States, especially about cities, towns, and farms. They have turned out to be a great nuisance, and but few people care for them. They are noisy and dirty in their habits. They fill gutters with their nests, that wash down and clog drain pipes. Sparks often catch in their nests under the eaves of houses and cause destructive fires. They do not sing, and what is worse, often drive out of a neighborhood most of the singing birds that would like to live there. They multiply rapidly, as a pair will often rear three broods of young in a year, and they lay from four to seven eggs in each nest. They eat seeds, garden vegetables, and some insects. English Sparrows are not protected by law. In neighborhoods where English Sparrows abound, bird-houses should be built without a perch in front of them, as these "ragamuffins" delight to sit on such a perch and annoy the tenants of the house.

White-Throated Sparrow

Zonotrichia albicollis (*Gmelin*)

A. O. U. Number 558

Other Names.—Peabody Bird; Cherrybird (in Adirondacks); Canada Bird; White-throated Crown Sparrow; White-throat; Nightingale (in Manitoba); Canada Sparrow; Peverly Bird.

General Description.—Length, 7¼ inches. Upper parts, rusty-brown, streaked with black; under parts, white and gray. Bill, small, compressed-conical; wings, long and pointed; tail, about length of wing, rounded or slightly double rounded.

Nest and Eggs.—Nest: Typical site on ground, in burnt-over clearings or coniferous forests; sometimes in low bushes near streams or borders of fresh-water swamps, in the evergreen woods; a rather bulky structure, of coarse grasses, strips of bark, moss, lined with fine blades of grass. Eggs: 4 or 5, minutely and evenly sprinkled or heavily blotched with dark brown on a pale greenish or pale buffy ground.

Distribution.—Eastern North America; breeding from Massachusetts, northern New York, Ontario, northern Michigan, northeastern Wyoming, eastern Montana, etc., northward to Great Bear Lake, west shores of Hudson Bay, Labrador, etc.; south in winter to Florida and southern Texas.

NEXT to the Song Sparrow no member of the family is so well known and well liked as the White-Throat. In Canada it is especially popular, and people there say that when it sings it says "Sweet Canada, Canada, Canada!" Others call it the "Peabody Bird," saying that it sings "Old man Peabody, Peabody, Peabody!"

This vigorous Sparrow is not very choice as to the location in which it lives. All it requires is the friendly shelter of a thicket, or some underbrush. It is equally at home in the garden, the hedgerow, the tangles along old fences, or the borders of heavy woodlands. During migration, and in its southern winter home, it is very sociable with other birds. Often two or three dozen White-throats will be found feeding together in the same tangle. Associated with them are usually members of other bush-loving species, such as Thrushes, Song Sparrows, and Slate-colored Juncos.

In summer the White-throat is found mated and caring for its young from northern New York and Massachusetts northward throughout a large part of Canada. Here on still mornings and quiet evenings the Peabody Bird's song floats to the ear with surpassing sweetness. It is protected by law wherever found north of the Rio Grande River. Its food consists of insects, seeds, and some wild berries.

CHIPPING SPARROW

SPIZELLA PASSERINA PASSERINA (*Bechstein*)

A. O. U. Number 560

OTHER NAMES.—Chip-bird; Chippey; Hair-bird; Social Sparrow; Hair Sparrow; Little House Sparrow.

GENERAL DESCRIPTION.—Length, 5½ inches. Upper parts, gray, rusty, and black, streaked; under parts, gray. Bill, small; wings, rather long and rather pointed; tail, shorter than wings, deeply forked, the feathers narrow and blunt.

NEST AND EGGS.—Nest: Built in bushes, hedges, or almost any kind of tree, especially cedars, usually close to houses, the orchard being a favorite locality; a delicate, openwork structure of fine, curly rootlets, cleverly interwoven and always thickly lined with horse-hair, sometimes constructed almost entirely of this material. Eggs: 3 or 4, rarely 5, bluish-green, thinly spotted with blackish-brown, often wreathed at large end.

DISTRIBUTION.—Eastern United States and British provinces, west to the Great Plains; breeding from near the Gulf coast northward of Nova Scotia, New Brunswick, Prince Edward Island, Province of Quebec, and wooded region in eastern side of the Saskatchewan plains; wintering chiefly in the more southern United States (Florida to Eastern Texas and northward); casual winter visitants to Cuba (and eastern Mexico?). Replaced in western North America by the Western Chipping Sparrow.

IN EARLY spring the Chipping Sparrow returns to its northern home. It is found not in the deep woods, nor very much in wide open fields. It likes old fields more or less grown up with bushes and briers, and dearly loves gardens, orchards, and shrubbery-covered lawns.

It is a most cheerful little bird, wearing a brown cap, and often repeating its rather uninteresting "chippy, chippy, ... chippy!" song, which sounds more like an insect than a bird. Its nest, in low trees or bushes, is always, so far as I have observed, lined with long hairs. For this reason the bird is often called the *Horse-hair Bird.*

In fall and winter the Chipping Sparrow eats a great many weed seeds, and thus is a very great friend of the farmer. During the warm part of the year it is equally valuable as a destroyer of insects.

As it is so fond of living about the house, its greatest enemy is naturally the domestic cat, and great numbers of both young and old are caught every year by these pets of the household.

Sparrows are all small birds, but the smallest of them all is the Chipping Sparrow. It weighs less than one ounce.

JUNCO

JUNCO HYEMALIS HYEMALIS (*Linnæus*)

A. O. U. Number 567

OTHER NAMES.—Slate-colored Junco; Snowbird; Black Snowbird; White Bill; Black Chipping Bird; Common Snowbird; Slate-colored Snowbird; Blue Snowbird; Eastern Junco.

GENERAL DESCRIPTION.—Length, 6 inches. Fore and upper parts, gray; under parts, white. Bill, small; wings, long and moderately rounded; tail, a little shorter than wing, double-rounded, the feathers narrow at the tips and blunt.

NEST AND EGGS.—Nest: Usually placed on the ground, under a tuft of grass or weeds, sometimes in rock crevices, or upturned tree roots; constructed mostly of dried grasses, thickly lined with hair, fur, and feathers. Eggs: 4 or 5, white or greenish-white, spotted with rufous-brown.

DISTRIBUTION.—Breeding from mountains of Pennsylvania, New York, and Massachusetts, Ontario, central Michigan, northern Minnesota, northward to Labrador, western shores of Hudson Bay, and through the interior to the Arctic coast and westward to valleys of the Yukon and Kowak rivers, Alaska; migrating southward in winter to Florida, Alabama, Mississippi, Texas, Arizona, and California, straggling (?) to Point Barrow and coast of Bering Sea (Kotzebue Sound, St. Michaels, etc.), and to eastern Siberia (Tschuctschi Peninsula).

The Junco is found all over North America from the tree-limit south to the Gulf coast and Mexico, ten varieties of this species being recognized, besides several other kinds.

HIGH up on the mountains of western North Carolina, where few birds are to be seen, you will find the Junco. It may be beside the trail, or in a little opening in the heavy forest, or even in the high heather-covered slopes. But see it you surely will, for it is everywhere.

If the time be spring or early summer it is well to remain quiet and watch. By doing so you may be rewarded by hearing the little slate-colored male indulge in one of his songs. It is not a very long song, nor very loud, and perhaps these are the reasons why so many people have never heard it. Look also for the nest hidden in a low bush or on the ground.

The more northern Junco very closely resembles the one found in the southern mountains. Most of us see it only in winter, when it comes with the snow. The little flocks will fly about the house if they are fed. Treat the Junco kindly, and it will soon become very tame, and feed without fear on the doorstep. As people generally think of this bird in connection with the snow of winter, it has acquired the name by which it is widely known—Snowbird.

SONG SPARROW

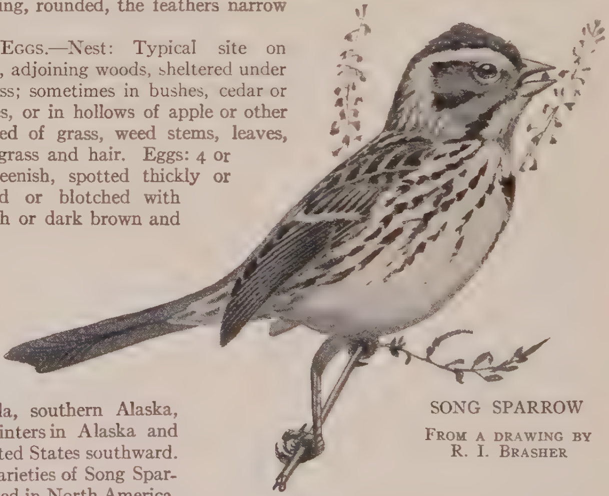
MELOSPIZA MELODIA (*Wilson*)

OTHER NAMES.—Silver Tongue; Everybody's Darling; Ground Sparrow; Hedge Sparrow; Bush Sparrow; Ground-bird; Marsh Sparrow; Red Grass-bird; Swamp Finch.

GENERAL DESCRIPTION.—Length, 6½ inches. Upper parts, brown and black in streaks; under parts, white, streaked with black. Wings, short and rounded; tail, about the length of wing, rounded, the feathers narrow and blunt.

NEST AND EGGS.—Nest: Typical site on ground, in fields, adjoining woods, sheltered under a tussock of grass; sometimes in bushes, cedar or other small trees, or in hollows of apple or other trees; constructed of grass, weed stems, leaves, lined with fine grass and hair. Eggs: 4 or 5, dull pale greenish, spotted thickly or sparsely spotted or blotched with shades of reddish or dark brown and lavender.

DISTRIBUTION.—Breeds in the United States (except the South Atlantic and Gulf States), southern Canada, southern Alaska, and Mexico; winters in Alaska and most of the United States southward. About twenty varieties of Song Sparrow are recognized in North America.



SONG SPARROW

FROM A DRAWING BY R. I. BRASHER

EVERYONE who knows the Song Sparrow likes it, for this trim little bird has no annoying habits, and thousands of people listen to its singing with the greatest pleasure. Its song from the top of a small roadside tree is the first bird music I hear in early spring. It haunts the margins of thickets and shrubbery, and is seldom seen among groves of high trees. Few other Sparrows have so wide a range, for in summer it is found from the Gulf States to northern Canada and Alaska.

Its nest is hidden with the greatest skill, and even where the birds are common it is not always easy to find. If you start out to search for one, the best way is to watch the birds carefully until one betrays the location of its nest by carrying food to its young. The nest you will find is made of grass, rootlets, dried leaves, and sometimes hair. It may be in a low bush, but more probably it will be on the ground hidden among the long grasses. Song Sparrows seek a great variety of food, but are especially fond of insects, of which they destroy immense numbers. They are therefore of great value to farmers.

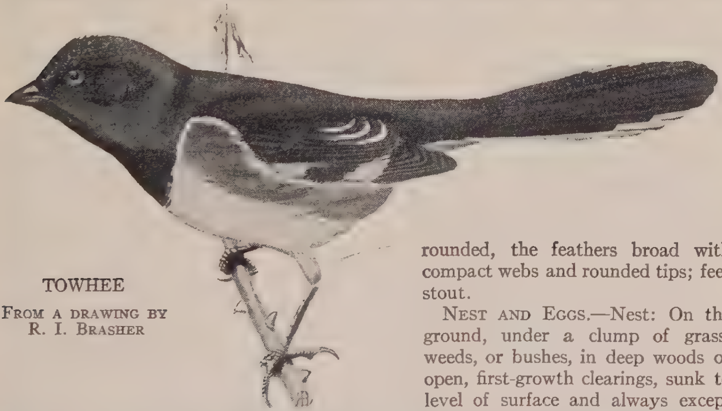
TOWHEE

PIPILO ERYTHROPHTHALMUS ERYTHROPHTHALMUS (*Linnæus*)

A. O. U. Number 587

OTHER NAMES.—Chewink; Towhee-bird; Swamp Robin; Bullfinch (in Virginia); Red-eyed Towhee; Ground Robin; Towhee Buntin; Jo-ree; Marsh Robin; Swamp Robin; Cherokee Robin; Bush-bird; Turkey Sparrow.

GENERAL DESCRIPTION.—Length, 8 inches. Fore and upper parts, black; under parts, white and brownish. Wings, rather short and much rounded; tail, longer than wing, rounded, the feathers broad with compact webs and rounded tips; feet stout.



TOWHEE

FROM A DRAWING BY R. I. BRASHER

NEST AND EGGS.—Nest: On the ground, under a clump of grass, weeds, or bushes, in deep woods or open, first-growth clearings, sunk to level of surface and always exceptionally well concealed; construction rather variable, sometimes carelessly made and others quite firm and compact; made of leaves, twigs, grass, and vegetable fibers, well lined with grass and rootlets. Eggs: 4, white or pale pinkish white, thickly sprinkled with light chestnut.

DISTRIBUTION.—Eastern United States and more southern British provinces west to edge of the Great Plains, in Manitoba, North Dakota, Kansas, Oklahoma, etc.; breeding from near the Gulf coast, north to Maine, Ontario, Manitoba, etc.; south in winter to southern Florida, Gulf coast in general, and eastern and central Texas; casual in New Brunswick.

The White-eyed Towhee is found in the coast region from Charleston, S. C., southward, including Florida. In western North America other Towhees are found.

THIS handsomely colored bird dwells in thickets. Here he jumps about in a most lively manner. Often one hears him scratching on the ground among the dead leaves, and making as much noise as a bird ten times his size. "Ground Robin," he is sometimes called. "Jo-ree" is also a common name. Others know him as the "Chewink," which is a very good imitation of one of his notes.

In spring the Towhee has a song, which is clear and very pleasing in tone. Mounting to the top of some bush or low tree he sends forth his melody over and over again for long periods. Mr. Ernest Thompson Seton interprets the song of the Towhee in the following combination of words. To him the bird sings: "Chuck-burr, pill-a-will-a-will-a!" The nest is placed on the ground at the foot of small bushes or shoots. Now and then it is even built in a bush a few inches above the ground.

In the Southern States, where the Towhee retires in winter, it is usually found in company with other bush-loving species, such as White-throated Sparrows, Song Sparrows, and Juncos. Living on the ground as these birds do, they naturally have many enemies, and yet so well do they take care of themselves they have managed to live and thrive, and are to-day a very abundant species in eastern United States.

CARDINAL

CARDINALIS CARDINALIS CARDINALIS (*Linnæus*)

A. O. U. Number 593

OTHER NAMES.—Cardinal Grosbeak; Redbird; Crested Redbird; Virginia Redbird; Virginia Nightingale; Virginia Cardinal; Kentucky Cardinal; Cardinal Bird.

GENERAL DESCRIPTION.—Length, 8¾ inches. Male, red; female, partly red, giving an appearance of being faded. Bill, stout; wings, short and rounded; tail longer than wing, slightly rounded; head with conspicuous crest.

NEST AND EGGS.—Nest: Located in thickets of brambles or grapevines or low saplings; a carelessly constructed, loosely put together affair of small twigs, strips of bark, weed stems, grass, lined with fine rootlets, and horse-hair. Eggs: 2 to 4, white, bluish, or greenish white marked with shades of chestnut, purple, and brown, usually scattered over entire surface.

DISTRIBUTION.—Eastern United States; north, regularly and breeding to southeastern New York, lower districts of eastern Pennsylvania, western Pennsylvania, northeastern Ohio, northern Indiana, southern Iowa, etc., casually or irregularly to Connecticut, Massachusetts, Maine, Nova Scotia, southern Ontario, southern Michigan, southern Wisconsin, and Minnesota; west to edge of Great Plains, casually to eastern Colorado; south to Georgia, Alabama, and upland region of Gulf States; Bermudas (introduced and naturalized). Replaced in southern Arizona by the Arizona Cardinal, in central and southwestern Texas by the Gray-tailed Cardinal, and in Florida by the Florida Cardinal.

THE male Cardinal is a brilliant red bird; in fact, he is spoken of as "Redbird" quite as frequently as he is called Cardinal. He is red almost all over, the most notable exception being a ring of black feathers around his heavy red bill. This is a popular songster, his loud, clear whistling notes adding greatly to the bird chorus of the thickets where he loves to dwell. The more plainly colored female is an accomplished singer also, which is not a usual custom among the mothers of the bird-world.

As Cardinals are birds of such showy plumage they are widely known among people of the regions they inhabit. Often they will come in the yard and flit from one bush or tree to another. Or you may catch sight of one darting across the garden like a streak of flame. In the country they may perch on the fence beside you, or fly up from the road before your horse. The nest with its three or four spotted eggs is hidden among the briers or low bushes. When the young have hatched, the male leads the young and cares for them while his mate is brooding a second setting of eggs. Until the Audubon Society laws were passed, thousands of Cardinals annually were captured and confined in cages.

ROSE-BREASTED GROSBEAK

ZAMELODIA LUDOVICIANA (*Linnæus*)

A. O. U. Number 595

OTHER NAMES.—Potato-bug Bird; Common Grosbeak; Summer Grosbeak; Rose-breast; Robin-redbreast.

GENERAL DESCRIPTION.—Length, 8¼ inches. Fore and upper parts, black or blackish-brown; under parts, red and white. Bill, heavy and short; wings, long and pointed; tail, more than ¾ length of wing, even or slightly rounded, the feathers broad and rounded at the ends.

NEST AND EGGS.—Nest: In low trees and bushes, sometimes on such slender branches that the eggs roll out when the support is bent by a strong breeze; a flat, rather carelessly made saucer-shaped structure of small twigs, wiry rootlets, and grass. Eggs: 3 to 5, greenish blue, spotted and blotched over entire surface with chestnut and shades of brown.

DISTRIBUTION.—Eastern United States and more southern British provinces, from Atlantic coast to edge of the Great Plains (eastern Kansas to Manitoba); breeding from New Jersey, Pennsylvania, northern Ohio, northern Indiana, northern Illinois, Iowa, and eastern Kansas, north to Manitoba, Ontario, Nova Scotia, etc., and south along the Allegheny Mountains to western North Carolina (3,500 to 5,000 feet); in winter south to Bahamas, Cuba, Jamaica and through Mexico and Central America to western Ecuador; casual in Bermudas.

THE male Rose-breasted Grosbeak, in his red, black, and white plumage, is among the most handsome of our wild forest birds. On the other hand, the female is so modestly attired that one might even suspect it of being a representative of some large species of Sparrow. Leaving their winter home in the tropics, these Grosbeaks journey northward and reach their breeding grounds in late April or early May. In migration it appears they rarely travel in flocks. Single birds are often seen winging along overhead, only now and then pausing to rest on the top of some tall tree. When night approaches they descend to the secure shelter of some thicket to sleep.

During the song period the Rose-breasted Grosbeak sometimes sings on moonlight nights after the custom of the Mockingbird. Its song to some ears strongly resembles the music of the Robin. The nest is built generally in saplings or small trees, often near a stream, or on the borders of woodlands. For food the Grosbeak eats insects and some berries. Also it consumes many varieties of seeds. When wheat is ripening in the fields it has been known now and then to take a few grains of this popular cereal.

BLUE GROSBEAK

GUIRACA CÆRULEA CÆRULEA (*Linnæus*)

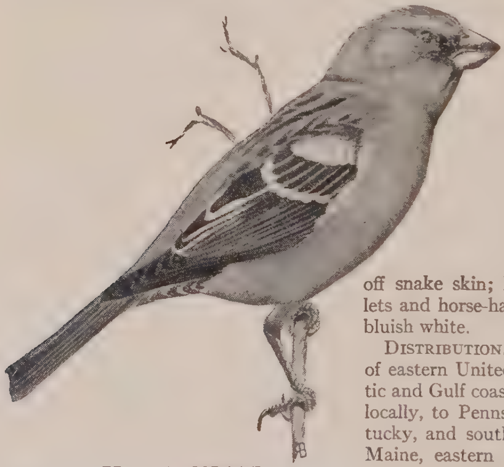
A. O. U. Number 597

OTHER NAMES.—Blue Pot; Blue Ricebird.

GENERAL DESCRIPTION.—Length, 7¾ inches. Male, blue; female, olive-brownish above and brownish-buffy below. Bill, large, conical, compressed, with nearly straight outlines; wings, long and pointed; tail, about ¾ length of wings, nearly even or very slightly rounded.

NEST AND EGGS.—Nest. Placed in low brambles, or in deciduous trees as far as thirty feet from the ground; a compact, well-built structure of dried grass, plant fibers, leaves, with an intertwined cast-off snake skin; lined with fine brown rootlets and horse-hair. Eggs: 3 or 4, plain light bluish white.

DISTRIBUTION.—More southern portions of eastern United States, chiefly near Atlantic and Gulf coasts; north regularly, but very locally, to Pennsylvania, New Jersey, Kentucky, and southern Illinois; accidentally to Maine, eastern Massachusetts, Province of Quebec; in winter south to Cuba and Yucatan.



BLUE GROSBEAK

FROM A DRAWING BY R. I. BRASHER

ABOUT the margins of quiet reed-grown ponds and rice-field reservoirs of the Southern States the Blue Grosbeak may be looked for any summer day. Old fields grown up in bushes or sprouts are other favorite haunts for this thick-billed, deep-blue bird. In a low bush or cluster of rank grass the nest is built only a little distance from the ground. Here while the female broods her eggs the male sings from the top of the tallest nearby tree. At times he descends and feeds her, or even sits in the nest while she goes in quest of food and exercise.

To some extent the Blue Grosbeak resembles the Indigo Bunting, but it is larger. Both birds frequent the same general localities, and in habits of feeding and nesting there are many points of similarity. The food of the Grosbeak consists in part of insects and a few berries. Mainly, however, it eats seeds. For example, it likes the grains of rice as it is ripening. Rarely more than one pair of birds will be found in any one field, unless it be one of large area. As the birds are so thinly distributed about the country and are never found in large flocks, their damage to the rice-crops is so small as not to be noticed or begrudged by the Southern planters.

Indigo Bunting

Passerina cyanea (*Linnæus*)

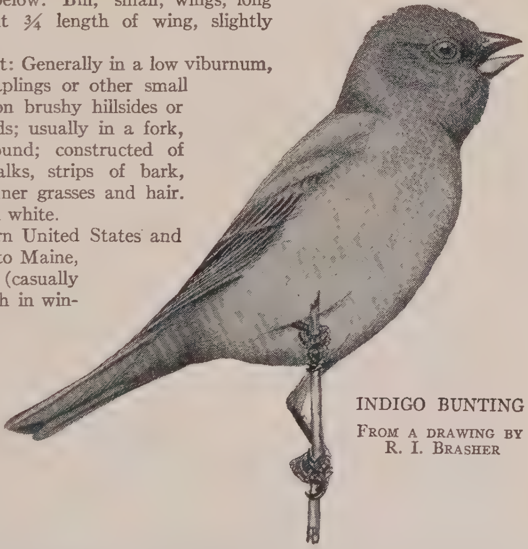
A. O. U. Number 598

Other Names.—Indigo Bluebird; Indigo Painted Bunting; Indigo Bird; Indigo Finch; Blue Finch; Blue Canary; Blue Pop.

General Description.—Length, 5¾ inches. Male, blue; female, olive-brownish above and dull white below. Bill, small; wings, long and pointed; tail, about ¾ length of wing, slightly double rounded.

Nest and Eggs.—Nest: Generally in a low viburnum, witch-hazel, or maple saplings or other small bushes, or in brambles on brushy hillsides or open clearings near woods; usually in a fork, within five feet of ground; constructed of grasses, leaves, weed stalks, strips of bark, plant fibers, lined with finer grasses and hair. Eggs: 4, plain pale bluish white.

Distribution.—Eastern United States and British provinces; north to Maine, Ontario, Minnesota, etc. (casually to New Brunswick); south in winter to Bahamas, Cuba, and through eastern Mexico and Central America to Panama; west to eastern border of Great Plains, casually to eastern Colorado.



INDIGO BUNTING
From a drawing by R. I. Brasher

Buntings are closely related to Sparrows, and even more nearly resemble Grosbeaks. Their beaks are thick and stout, which must help them in the task of crushing seeds. The Indigo Bunting, or

Indigo Bird, lives in the United States only during the warm months, the remainder of the year being passed in Central America.

This is one of the birds that shun the thick forests. It is distinctly a dweller of open places. Pastures with clusters of bushes here and there seem to be their favorite abiding place.

The two birds are very dissimilar in appearance, the male possessing a coat of deep blue and the female at a little distance resembling a Sparrow. The quiet coloring of the mother-bird surely serves as a great protection when late in spring she takes up the duty of incubating the eggs. Were she garbed in the bright colors of her mate, many an Indigo Bunting's nest would come to grief from the attack of some Hawk, Crow, or other winged enemy. The nest, placed usually in a low bush, is made largely of fragments of leaves, strips of bark, and grasses.

The male is a gifted songster, and adds his melody to the springtime chorus from some elevated perch on bush or tree.

Scarlet Tanager

Piranga erythromelas *Vieillot*

A. O. U. Number 608

Other Names.—Black-winged Redbird; Fire-bird; Canada Tanager; Pocket-bird; Scarlet Sparrow.

General Description.—Length, 7 inches. Male: in summer, red with black wings and tail; in winter, red replaced with yellowish-green and yellow. Female: body, yellowish-green above and yellow below; wings and tail, brownish-gray. Bill, stout; wings, moderately long and pointed; tail, shorter than wing, notched.

Nest and Eggs.—Nest: On horizontal limb of low saplings, generally low, but sometimes 40 feet up, in retired woodlands; a flat, loosely-put-together structure of stems, roots, and bark strips, lined with rootlets and fine inner bark; some composed almost entirely of brownish rootlets. Eggs: 3 to 5, generally 4, greenish-blue, speckled and blotched with chestnut; occasionally the eggs are very faintly and finely spotted, altogether lacking the usual bold markings.

Distribution.—Eastern United States and more southern British provinces, north to New Brunswick, Nova Scotia, northern Ontario, Manitoba; breeding southward at least to Virginia, Kentucky, Missouri, etc. (in Allegheny Mountains to South Carolina); in winter migrating southward to West Indies and through Mexico, Central America, and northern South America to Bolivia and central Peru; west, casually to eastern Colorado and Wyoming.

No bird of the northland is more brightly colored than the Scarlet Tanager. The plumage of the male is bright scarlet, except the wings and tail, which are black. The female, however, is very quietly dressed, being olive-green and brown. In the spring and summer, which are the only times of year when they are with us, they occupy a most conspicuous place in the bird-world. The loud, clear "chip-chirr" call-notes reach the ear as one passes through the woods or park. They also possess a song that somewhat resembles that of the Robin. They are distinctly birds of forest regions, and rarely come into the open fields or pastures. Their diet of insects is secured among the foliage of trees. Their nests, too, are built in trees, frequently on a horizontal limb.

The winter home of this Tanager is in South America, which means that a flight of thousands of miles is necessary each year for the birds to carry through the program laid out for them by Mother Nature.

Wherever seen the Scarlet Tanager attracts attention. One spring recently many stopped in the few trees now standing in City Hall Park, New York City. Thousands of people hurrying by paused to watch and marvel at their rare beauty.

PURPLE MARTIN

PROGNE SUBIS SUBIS (*Linnæus*)

A. O. U. Number 611

OTHER NAMES.—Martin; Black Martin; House Martin; Rainbird.

GENERAL DESCRIPTION.—Length, 8 inches. Plumage, steel-blue. Bill, stout; tail, about ½ length of wing, forked for about $^1/_3$ of its length.

NEST AND EGGS.—Nest: In boxes erected for their use, a few pairs occasionally returning to primitive conditions and nesting in hollow trees; nesting material consisting of nearly anything handy—leaves, rags, paper, string, straw, or grass. Eggs: 4 to 6, pure glossy-white, unmarked.

DISTRIBUTION.—Temperate North America, except Pacific coast district; breeding north to Maine, New Brunswick, Nova Scotia, northwestern Ontario, Manitoba, Montana, and Idaho; breeding southward to southern Florida, southern Texas, and plateau of Mexico; in winter, from southern Florida and Mexico to Venezuela and Brazil; accidental in Bermudas and British Isles. Replaced in the Pacific coast region by the Western Martin.

THE Purple Martin is another of the Swallow family that has very largely changed its habits of nesting since people from Europe settled in America. In the days when this country was a wilderness the Martins built their nests in holes of forest trees and in gourds that were sometimes hung up for them about Indian encampments. To-day they use for their nests the bird-boxes people make and erect on poles, and only in the wildest sections will one still find them inhabiting hollow trees.

These birds feed entirely on flying insects that they capture as they circle about through the air. They are very brave little birds, and will attack any Crow or Hawk that comes near their nesting places. For this reason Martins are much liked by the people in the country who raise chickens, and thousands of Martin houses are put up every year by those who hope to induce these birds to come and spend the summer with them.

Martins cannot be called songbirds, although they engage in much cheerful twittering among themselves. Late in June, when the young are able to fly, they gather in large flocks, and often roost for weeks in a grove. Sometimes these flocks become very large, and as many as two hundred thousand may come together in one place for the night.

CLIFF SWALLOW

PETROCHELIDON LUNIFRONS LUNIFRONS (*Say*)

A. O. U. Number 612

OTHER NAMES.—Eave Swallow; Jug Swallow; Barn Swallow; Mud Swallow; Republican Swallow; Crescent Swallow; Rocky Mountain Swallow; Moon-fronted Swallow; Rainbird.

GENERAL DESCRIPTION.—Length, 6 inches. Upper parts, steel-blue; under parts, chestnut and whitish. Bill, very short; tail, less than ½ length of wing, slightly notched.

NEST AND EGGS.—Nest: A cleverly constructed retort-shaped structure, fastened to cliffs or under eaves of outbuildings at its large end and extending horizontally; made of mud pellets mixed with straw and lined with feathers. Eggs: 3 to 5, speckled and spotted with reddish-brown and lilac.

DISTRIBUTION.—Nearly the whole of North America; breeding north to Nova Scotia, New Brunswick, Anticosti Island, Province of Quebec, in the interior to Territory of Mackenzie and the Yukon Valley of Alaska, and on the Pacific coast to British Columbia; breeding southward over nearly the whole of the United States (except Rio Grande valley, at least above mouth of the Pecos River) and coast district of northwestern Mexico, as far as Mazatlan and Tepic. In winter, southward through Mexico and Central America, at least to Honduras. Said to occur in winter in Brazil, Paraguay, Argentina, and other parts of South America. Two other varieties of Cliff Swallow are found in North America.

IT IS probably true that Cliff Swallows have increased in numbers since white men settled in this country. The reason for this will be explained. The birds build gourd-shaped nests of mud. In days gone by the only situations in which they could place them were the sides of cliffs. When heavy rains fell many of the nests must have been melted and washed away. When white men came and began to build barns, the Cliff Swallows found better places for their nests. Now, all over the country in spring their mud cradles are found stuck to the sides of barns well up under the eaves where the rain cannot reach them.

Cliff Swallows nest in colonies, sometimes a hundred pairs rearing their young under the shelter of the eaves of one barn. The mud is gathered from puddles or along the shores of streams and ponds. In little pellets it is carried away and the nest gradually built up. It is about five inches through, and has a short neck at one side, in the end of which is the small entrance hole. It is lined with fine grasses and other soft materials.

When the young can fly the families unite with others and the flocks move away to the tropics to pass the winter.

BARN SWALLOW

HIRUNDO ERYTHROGASTRA *Boddaert*

A. O. U. Number 613

OTHER NAMES.—American Barn Swallow; Barn-loft Swallow; Fork-tailed Swallow; Rain-bird.

GENERAL DESCRIPTION.—Length, 7 inches. Upper parts, steel-blue; under parts, chestnut and red. Bill, small and depressed; tail, $^2/_3$ length of wing, or longer, and forked for more than $^1/_3$ of its length, the side feathers becoming gradually narrower and more drawn out to the outermost, which are sometimes almost thread-like for the end portion, but always with blunt tips.

NEST AND EGGS.—Nest: A bowl-shaped hemisphere, attached to barn or other buildings, timbers, or on sides of cave; constructed of mud pellets mixed with straw and grass, thickly lined with feathers. Eggs: 3 to 6, white marked with spots of bright Indian red, brown, and lavender.

DISTRIBUTION.—North America in general, north to Alaska, northern Mackenzie, southern Manitoba, and southern Ungava; breeding southward over whole of United States (except Florida); in winter from southern Florida and southern Mexico, through Central America and South America as far as southern Brazil, Paraguay, Argentina, Bolivia, and Peru, and throughout West Indies; occasional in Bermudas.

THE Barn Swallow is so graceful, friendly, and altogether attractive that it has long been one of our most beloved birds. It likes to live around the farm house. Into the doorway of the barn or through a broken window we see it fly over and over on a summer's day. Sometimes many birds are about, and a dozen or more pairs may have their nests on the rafters up above the hay loft. They may even come to the house and make their nests of mud, grass, and feathers under the shelter of the veranda roof. As they flutter near their nests or circle low about the barn-yard or fields, they give vent to many twitters that seem filled with cheer and good will.

In appearance the Barn Swallow resembles the Cliff Swallow, with which it is often associated. On the wing, however, it may be distinguished by its deeply forked tail. Swallows feed on insects. These they capture in the air. In winter, of course, there are no flying insects to be found, so the Barn Swallows leave us for far-off southern countries, and do not return until the next spring, when new broods of insects again fill the air.

CEDAR WAXWING

BOMBYCILLA CEDRORUM *Vieillot*

A. O. U. Number 619

OTHER NAMES.—Cherry Bird; Cedar Bird; Southern Waxwing; Carolina Waxwing; Canada Robin; Recollet.

GENERAL DESCRIPTION.—Length, 7¼ inches. Plumage of perfectly blended colors, the effect being a pinkish grayish-brown with yellow on abdomen and tip of tail.

NEST AND EGGS.—Nest: Generally in an orchard, within 20 feet of the ground; rather bulky, constructed of twigs, leaves, grasses, strips of bark, twine, paper, and rags; lined with fine grass, horse-hair, or wool. Eggs: 3 to 5, bluish-gray to dull olive, marked with spots and blotches of sepia and dark purple.

DISTRIBUTION.—Temperate North America in general; breeding from Virginia, western North Carolina, Kentucky, Kansas, New Mexico and Arizona (in mountains), and Oregon, northward to Prince Edward Island, southern shores of Hudson Bay, Manitoba, Saskatchewan, and British Columbia; wintering in whole of United States (in wooded districts), and migrating southward to Bahamas, Cuba, Little Cayman, and Jamaica, in West Indies, and through Mexico and Central America to highlands of Costa Rica; accidental in Bermudas and British Isles.

THE Cedar Waxwing is covered with a coat of silky, brownish feathers that makes it a most elegant appearing bird. Its quiet, refined manner adds to the general effect of gentility that it always produces. They have many dainty ways when feeding that greatly endear them to bird-students. Apparently they never fight over their food; and two or more may be seen feeding on a single persimmon, or even passing berries or worms to one another. In the southern States flocks of one hundred or more individuals may be found during the winter months. They fly in compact companies, and when lighting on a tree usually perch very close together.

Cedar Waxwings breed late in the season. Most birds in the central and northern States build their nests in the months of May or June, but the Waxwings generally wait until July. At this season they are found in orchards, cedar thickets, or along the borders of woods or by lake-sides.

The nest is bulky, and made of a wide variety of materials, including twigs, moss, rootlets, strings, strips of bark, etc. The male has no song, but the birds produce a series of pleasing little whistles that Thoreau once called their "beady notes."

MIGRANT SHRIKE

LANIUS LUDOVICIANUS MIGRANS *W. Palmer*

A. O. U. Number 622*e*

OTHER NAME.—Butcher Bird.

GENERAL DESCRIPTION.—Length, 8½ inches. Upper parts, light grayish-blue; under parts, white; wings and tail, black.

NEST AND EGGS.—Nest: In bushes or thorny trees, principally north of the United States; a large, rude structure of twigs, grasses, leaf, and weed stems, lined thickly with moss and feathers. Eggs: 4 to 6, pale bluish green, spotted with brown and dull purple.

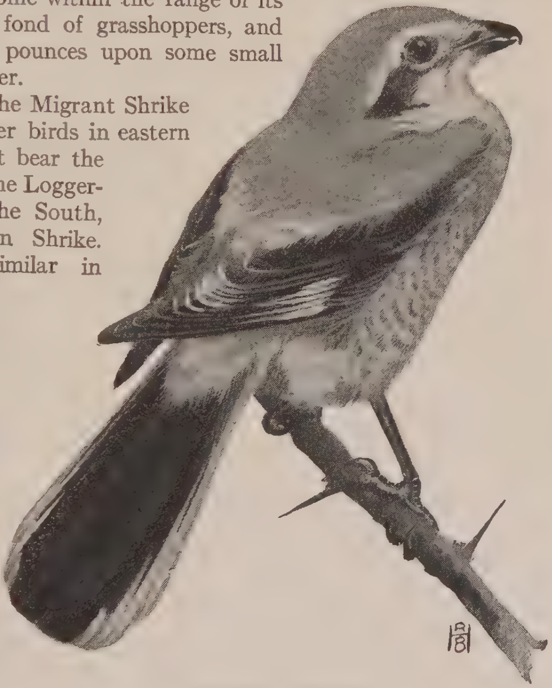
DISTRIBUTION.—Eastern North America; breeds from northern Minnesota, Wisconsin, Michigan, southern Ontario, south Quebec, Maine, and New Brunswick south to eastern Kansas, southern Illinois, Kentucky, western North Carolina, and interior of

Virginia (locally in the east); winters from the Middle States and southern New England to Texas, Louisiana, and Mississippi. Replaced in the southeastern United States by the Loggerhead Shrike, in western North America by the White-rumped Shrike, and in the Pacific coast region by the California Shrike and the Island Shrike. In northern North America is found the larger Northern Shrike.

When a Shrike is first seen it is perhaps perched on some roadside stake or telephone pole. From such an outlook this fierce, little gray bird keeps a sharp watch on the ground below for any lizard, small snake, or insect that may come within the range of its view. It is very fond of grasshoppers, and now and then it pounces upon some small Sparrow or Warbler.

In addition to the Migrant Shrike there are two other birds in eastern United States that bear the same name, viz., the Loggerhead Shrike of the South, and the Northern Shrike. All are very similar in appearance and habits of life. All of them, for example, have a way of sticking their extra food upon thorns and leaving it there, much as a butcher hangs up his meat. It is very natural, therefore, that one name by which all the Shrikes are known is the "Butcher Bird."

When flying to its perch the Shrike moves forward with rapidly beating wings, often low to the ground, until very near the tree or stake on which it intends to alight; then with a sudden upward swing it rises almost straight to its landing place. In spring the Shrike has a weak, squeaky little song that does not rate the bird very high among the myriad songsters of the great forests.



MIGRANT SHRIKE
From a drawing by R. Bruce Horsfall

RED-EYED VIREO

VIREOSYLVA OLIVACEA (*Linnæus*)

A. O. U. Number 624

OTHER NAMES.—The Preacher; Red-eyed Greenlet; Red-eye; Little Hang-nest; Preacher Bird.

GENERAL DESCRIPTION.—Length, 6½ inches. Upper parts, grayish-green; under parts, white.

NEST AND EGGS.—Nest: In forks of smaller or large trees, usually within 10 feet of ground but often much higher; a beautiful, pensile structure of finely woven vegetable fiber, strips of bark, grasses, and cobwebs and lined with fine grasses, ornamented exteriorly with cocoons, bits of wasps' and spiders' nests. Eggs: 3 to 5, white, sparingly speckled with reddish-brown and umber.

DISTRIBUTION.—Temperate North America in general, except arid districts; north to Nova Scotia, Prince Edward Island, Keewatin, Saskatchewan, and southern Mackenzie· west to British Columbia (both sides of Cascade range), Washington, Colorado, Utah, etc.; breeding south over whole of wooded region east of Rocky Mountains as far south as Caloosahatchee River, southern Florida, and as far west as Tom Green county, western Texas; wintering from southern Florida to Bahamas, and through Mexico, Central America, and South America as far as Brazil.

ONE of the best known birds in eastern United States is the Red-eyed Vireo. It is abundant over much of the territory where it is found, and is not as timid as many other birds. So tame is it at times that the writer has on various occasions touched a brooding bird before it would leave its nest. Another reason why so many people have learned to know this Vireo lies in the fact that it is not only a forest species, but also is abundant in villages, parks, and in fact almost anywhere that trees are found. I have seen a nest on a limb within fifteen feet of a kitchen door. The nest is a cradle swing in a fork of twigs well out toward the end of a leafy branch.

Most wild birds sing but little after the brooding season, but the Red-eyed Vireo is a pronounced exception to this rule. In spring it announces its arrival with a shouting song, so loud, so clear, and so far-carrying that the volume of sound for so small a singer is one of the wonders of the bird world. It seems to enjoy greatly its power of song, for the notes are repeated over and over again almost the livelong day. When the young have been reared it does not quit singing, but continues on during the hot days of summer after the music of most birds has ceased to be heard.

YELLOW WARBLER

DENDROICA ÆSTIVA ÆSTIVA (*Gmelin*)

A. O. U. Number 652

OTHER NAMES.—Summer Warbler; Yellow Titmouse; Summer Yellowbird; Yellowbird; Yellow Poll; Blue-eyed Yellow Warbler; Golden Warbler; Wild Canary (incorrect).

GENERAL DESCRIPTION.—Length, 4¾ inches. Fore and under parts, yellow; upper parts, yellowish olive-green; under parts, streaked with chestnut. Bill, shorter than head, slender, tapering gradually to the tip; wings, moderately long and pointed; tail, slightly rounded.

NEST AND EGGS.—Nest: Generally located in hedges and small saplings, within 10 feet of the ground, and strongly fastened in forks; constructed very neatly of grayish colored plant fibers and slender pliable strips of bark and lined with down and feathers; in some cases built entirely of cat-tail down, forming an exquisitely soft receptacle for eggs and young. Eggs: 2 to 6, usually 4, with a greenish-white ground spotted and splashed around large end with shades of brown, lilac-gray, and some black.

DISTRIBUTION.—North and South America; breeds in North America east of Alaska and Pacific slope from tree limit south to Nevada, northern New Mexico, southern Missouri, and northern South Carolina; winters from Yucatan to Guiana, Brazil, and Peru. Other varieties of the Yellow Warbler are found in other parts of North America.

THIS is the bird that thousands of people every spring and summer call the "Wild Canary." But although it is a wild bird it is not a Canary of any kind. Canaries have short, heavy bills for crushing seed, while Warblers have sharp, slender bills for catching insects. There are also many other differences. All over the country where Yellow Warblers are found they live in open places like orchards, shade trees along quiet streets, in untilled fields, and on the lawns. The male has a very pleasing little song, and may be heard singing at almost any time of day, but especially in the forenoon.

The nest is of very fine grasses, plant-down, and sometimes horsehair. It is compact, and makes a snug cradle for the four or five little babies that are soon to be rocked by every passing breeze. Look for the nest in trees and bushes from two to twenty feet from the ground. At Lake Champlain many nests are built in low bushes along the shore. They are favorite nests for the lazy Cowbird to deposit her eggs in, and thousands of these parasites are every year hatched and reared by the hard-working Warbler parents.

Yellow Warblers leave the United States when winter comes and go South where insects may be found.

MYRTLE WARBLER

DENDROICA CORONATA (*Linnæus*)

A. O. U. Number 655

OTHER NAMES.—Myrtle Bird; Yellow-rump; Yellow-rumped Warbler; Golden-crowned Fly-catcher; Golden-crowned Warbler; Yellow-crowned Warbler.

GENERAL DESCRIPTION.—Length, 5½ inches. Summer plumage: Upper parts, bluish-gray, streaked with black; under parts, white, black, and yellow. Winter plumage: Upper parts, grayish-brown; under parts, brownish-white with black streaks. Bill, shorter than head, slender, tapering gradually to the tip; wings, long and pointed; tail, nearly even.

NEST AND EGGS.—Nest: Placed usually in a coniferous tree but a few feet up; bulky and carelessly built of small spruce and hemlock twigs, vegetable fibers, old leaves, and lined with hair, small roots, and some feathers. Eggs: 3 to 5, dull white or creamy, speckled and blotched with shades of chestnut, brown, and lilac-gray, often in wreath around larger end.

Distribution.—North America in general, chiefly east and north of Rocky Mountains; breeding from mountains of western Massachusetts, northeastern New York, northern Michigan, Manitoba, etc., to limit of tree growth, wintering from the United States (except extreme northern portions) southward to West Indies, through Mexico and Central America to Panama; on Pacific coast from central Oregon to southern California; accidental in Greenland and eastern Siberia.

This is one of the best-known members of the Warbler Family. It can easily be told from any of the other fifty species of the family found in eastern United States if one will remember this fact: it has yellow patches of feathers on the crown, lower back and sides of the breast.

In summer it is found in the northern tier of States and throughout the most of Canada. From New Hampshire southward, therefore, we cannot expect to see it until autumn draws near. It is one of the birds which while feeding largely on insects in warm weather does not hesitate to change its diet when insects become scarce.

In autumn we find it eating the fruit of the bayberry and myrtle. This Warbler does not always think it necessary to fly away to the tropics in winter, as most warblers have the habit of doing. True, some of them do go south to Panama, but many others pass the winter as far north as New Jersey. They are especially abundant among the sand dunes along the coast of our southern States, where the berries of the yaupon furnish them with an abundant food supply. When hunting insects this bird often catches them in the air, making short flights for the purpose much as do the Flycatchers.

Blackburnian Warbler

Dendroica fusca (*Müller*)

A. O. U. Number 662

Other Names.—Hemlock Warbler; Torch-bird; Fire-brand; Orange-throated Warbler.

General Description.—Length, 5 1/4 inches. Upper parts, black or blackish with spots of yellow and white; under parts, orange and yellow. Bill, shorter than head, slender, tapering gradually to the tip; wings, long and pointed; tail, notched.

Nest and Eggs.—Nest: An elegant, compact structure of cat-tail down, hemlock twigs, fine grasses, rootlets, and strips of bark and lined with horse-hair and fine lichens; placed almost always in a conifer, spruce or hemlock preferred, usually at great height, in one instance 84 feet. Eggs: Usually 4, grayish or bluish-white, blotched and speckled with cinnamon and olive-brown.

Distribution.—Eastern North America and northern South America; breeds from Manitoba, southern Keewatin, central Ontario, Quebec, and Cape Breton Island to central Minnesota, Wisconsin, northern Michigan, Massachusetts, and Connecticut, and in the Alleghenies from Pennsylvania to Georgia and South Carolina; winters from

Colombia to central Peru and less commonly north to Yucatan; in migration to Nebraska, Texas, and Kansas, straggling to Utah, New Mexico, and the Bahamas.

In May, when the fresh, new leaves have as yet barely reached their growth, we may look for the Blackburnian Warbler. It may be in the shade trees beside the street, in the shrubbery on the lawn, or among the apple-trees of the orchard. It is any place and every place where there are plants and trees that insects infest. It is not alone, for many other Warblers also are about, and fresh troops of them are arriving nightly from the South.

Look for a small, active bird with a rich orange throat and breast. The rest of its plumage is black, with here and there a patch of white. A male Blackburnian Warbler is a thing of beauty, and the boys or girls who do not know it by sight have something of great interest yet ahead of them.

These birds are only five and one-quarter inches long, but despite their small size they are wonderful flyers. Their winter home is in South America. This means that twice a year they must journey over thousands of miles of sea and land. In summer they are to be looked for in the forests of cone-bearing trees mainly of the Northern States and Canada. Their little nests of sticks and grasses are hidden far up among the limbs of the evergreens.

Oven-Bird

Seiurus aurocapillus (*Linnæus*)

A. O. U. Number 674

Other Names.—Golden-crowned Thrush; Teacher; Nightingale; Wood Wagtail; Golden-crowned Wagtail; Golden-crowned Accentor.

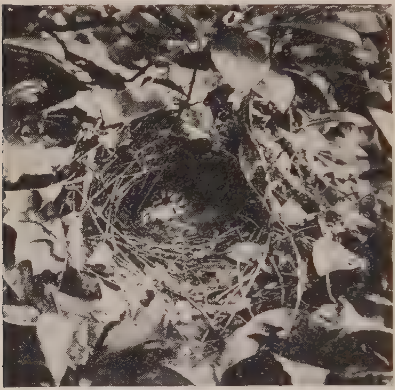
General Description.—Length, 6¼ inches. Upper parts, olive; under parts, white, with black spots. Bill, shorter than head, slender, tapering gradually to the tip; wings, long and pointed; tail; even or slightly notched.

Nest and Eggs.—Nest: Imbedded in ground in dry woods; of dried grass, artfully arched over with dead leaves and so perfectly blending with its surroundings as to be rarely discovered unless the bird is scared from the nest. Eggs: 3 to 6, glossy white, marked by specks and spots scattered over entire surface, usually more thickly around larger end.

Distribution.—North America; north to Nova Scotia, Anticosti Island, Labrador (?), southern and western shores of Hudson Bay, and the Yukon Valley in Alaska; west to eastern base of Rocky Mountains in Colorado and Montana, accidentally to British Columbia; breeding southward at least to Virginia, the Ohio Valley, and Kansas, probably much farther, and in the Bahamas; in winter, Gulf coast of United States, Bahamas, Greater Antilles, Swan Island and Old Providence Island, Caribbean Sea, and through Mexico into Central America, and northern South America (Colombia).

We may speak of the Oven-bird as a Warbler that lives on the ground. A wood with thick underbrush is its favorite haunt. Here among the leaves it moves about seeking its food. This is one of the few small birds that do not progress by hops—it walks. During the spring months it sings all day. "Teacher! teacher! teacher!" it continually calls. Each note is louder than the one before. Because of its song it is often called the "Teacher Bird." Sometimes it sings from the ground, but more often, perhaps, from a log or the limb of some low bush.

Courtesy of Outing Publishing Co.



OVEN-BIRD ON NEST

FROM A PHOTOGRAPH BY H. K. JOB

You may pass through a woodland where the Oven-birds are singing on every side, and yet not find one. Few birds are so much in evidence by their songs, and so much out of sight when you try to see them.

Its nest is also very hard to find. Among the leaves in the cover of the underbrush it is hidden. Leaves and grass arch over the top, and the bird enters through a hole in the side. Thus the nest is shaped much like an old-fashioned oven, hence the name "Oven-bird." In winter these little ground-walking birds all retire to the far South, where insect food can more readily be found, and where snow does not cover the earth.

Maryland Yellow-Throat

Geothlypis trichas trichas (*Linnæus*)

A. O. U. Number 681

Other Names.—Olive-colored Yellow-throated Wren; Yellow-throat; Western Yellow-throat; Northern Yellow-throat; Northern Maryland Yellow-throat; Black-masked Ground Warbler; Ground Warbler.

General Description.—Length, 4¾ inches. Upper parts, olive-green; under parts, yellow and buffy. Bill, decidedly shorter than head, tapering gradually to the tip; wings, short and much rounded; tail, about the same length as wing and much rounded.

Nest and Eggs.—Nest: Placed close to ground but raised clear by a platform of dried grass and leaves, and usually in damp locations and carefully hidden beneath a tussock or patch of briers; large and bulky for size of bird; composed of coarse grass, leaves, rootlets lined with finer grass, and a few hairs. Eggs: 3 to 5, commonly 4, shiny white, specked and blotched with chestnut, purplish-black, brown, and a few spots of lilac.

Distribution.—Eastern North America; breeds from North Dakota, northern Minnesota, northern Ontario, and southern Labrador south to central Texas, northern parts of the Gulf States, and Virginia; winters from North Carolina and Louisiana to Florida, the Bahamas, Cuba, Jamaica, Guatemala, and Costa Rica. In other parts of North America replaced by other varieties of this species.

ONE of the best-known and easiest-discovered of our Warblers is the Maryland Yellow-throat. Search for it in brier tangles or among low bushes and clusters of tall grass and reeds, especially near streams or ponds. You may hear its sharp notes of "pit, quit!" before you see it. Be patient, for it will soon come in sight. Out of a bush it will suddenly appear, its black mask contrasting strongly with its bright yellow throat. One peep it will make and then vanish, only to reappear in a short time, as if its curiosity about you impelled it again to come from its hiding. Seldom does one see the bird many feet from the ground.

The Maryland Yellow-throat feeds chiefly on insects or insect larvæ. These morsels of food it collects from the twigs and leaves of the bushes, or among the carpet of dead leaves on the ground. The male has a fair gift for singing, and about the nest its song may often be heard, especially during the first half of the day. Living on and near the ground, as the Yellow-throat does, it very naturally has many enemies; for instance, black snakes have been known to steal the baby birds from their cradles, and many of the old and young alike are eaten by pet cats.

YELLOW-BREASTED CHAT

ICTERIA VIRENS VIRENS (*Linnæus*)

A. O. U. Number 683

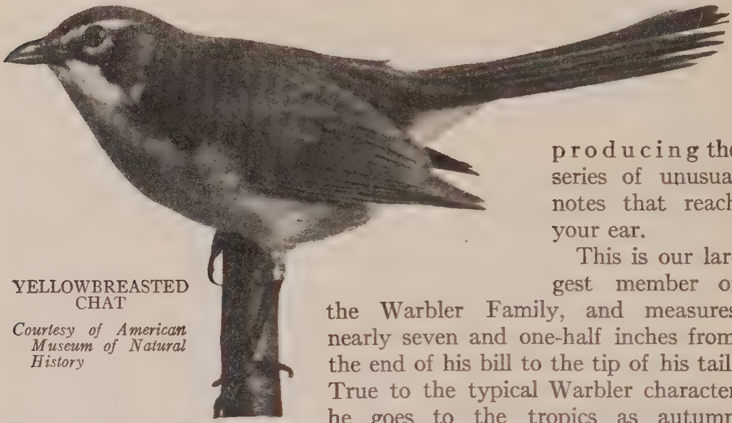
OTHER NAMES.—Chat; Common Chat; Yellow Chat; Yellow Mockingbird; Polyglot Chat.

GENERAL DESCRIPTION.—Length, 7½ inches. Upper parts, olive-green; under parts yellow and white. Bill, much shorter than head, stout, and arched; wing, moderate in length, rounded; tail, as long or longer than wing, rounded, the feathers narrow, with rounded tips.

NEST AND EGGS.—Nest: Built in midst of tangled thickets or briers from 3 to 5 feet up; constructed of dead leaves, strips of bark, dried grass, and weed stalks and lined with fine grasses. Eggs: 3 to 5, usually 4, pure white, tinged with pink when fresh, generally fairly evenly spotted with clearly outlined specks of chestnut and lavender, sometimes coalescing into a wreath around larger end.

DISTRIBUTION.—Eastern North America; breeds from southern Minnesota, Wisconsin, Michigan, Ontario, Central New York, and southern New England south to southeastern Texas, southern parts of Gulf States, and northern Florida; winters from Pueblo, Vera Cruz, and Yucatan to Costa Rica; casual in Maine. Replaced in western United States by the Long-tailed Chat.

THE Chat is the clown of the bird-world. He has a way of rising several yards in the air, and then tumbling down again in a most odd and amusing manner. Also, he indulges in a wide variety of curious calls, whistles, and clucks. When approaching a cluster of bushes in which a Chat is performing, you may wonder whether there are not half a dozen birds producing the series of unusual notes that reach your ear.



YELLOWBREASTED CHAT

Courtesy of American Museum of Natural History

This is our largest member of the Warbler Family, and measures nearly seven and one-half inches from the end of his bill to the tip of his tail. True to the typical Warbler character he goes to the tropics as autumn arrives. When the summer birds come trooping northward in spring, we may soon look for the Chat. Do not seek for him in thick woods or the open fields, for he is not there. He haunts the thickets that grow up in old abandoned fields, or in the bushes growing along streams flowing through meadow-lands. Cut-over woods with brush piles and clusters of new grown tree-sprouts attract him. In such places you will find the nest. It is hidden in a bush near the ground, and may contain three or four white spotted eggs.

Dipper

Cinclus mexicanus unicolor *Bonaparte*

A. O. U. Number 701

Other Names.—Water Ouzel: American Water Ouzel; American Dipper.

General Description.—Length, 8 inches. Slate-color.

Nest and Eggs.—Nest: In a crevice of rocks or among roots of trees, always placed near running water, often where spray keeps the outside damp, and sometimes behind a cascade; a beautiful sphere of soft green moss about seven inches in diameter, sometimes dome-shaped, deeper than wide, with a small round entrance and strongly arched and braced with leaves, grass, and twigs, cemented with mud. Eggs: 3 to 5, plain, pure white.

Distribution.—Mountains of western North America, from Rocky Mountains (including Black Hills of South Dakota) to the Pacific coast, and from the Mexican boundary (western Texas to southern California), and northern Lower California to northern Alaska. (Resident throughout, even in Alaskan localities.)

In general color and size a Water Ousel suggests a Catbird with a short tail, although in no way is it closely related to this well-known songster. In America it is an inhabitant of the dashing streams of our western mountains. Here its entire life is spent, being a non-migratory species. Few birds so love the water, as the reciting of some of its characteristics will indicate. It feeds on water insects and small mollusks that it secures by wading, not only in the shallows but along the bottom of the streambed with the water rushing over its submerged body and head. In going into deep water the bird usually walks out from the shore, and as seen from above appears to progress with as much ease as when wading along the margin. At times, however, it flies directly in from above. The bird's body is closely covered with a thick covering of down beneath the feathers, which probably protects its skin from coming in actual contact with the water of the glacial streams. The nest is a ball of moss about as large as a man's head, the entrance hole being only large enough to admit of the bird's passage. Of the four nests the writer has found in Montana and Wyoming, all were constantly wet with sprays from waterfalls, and in one case the bird had to pass beneath the falls to reach its young. In flight the Water Ousel follows the windings of the stream it haunts, and so far as I am aware never cuts off any bends by flying across the land.

Mockingbird

Mimus polyglottos polyglottos (*Linnæus*)

A. O. U. Number 703

Other Names.—Mock Bird; Mocking Thrush; Mimic Thrush; Mocker.

General Description.—Length, 10 inches. Upper parts, brownish-gray; under parts, white and gray. Bill, shorter than head; wings, long and rounded; tail, longer than wing, rounded, the feathers moderately broad with rounded tips.

Nest and Eggs.—Nest: Composed of twigs, grasses, and weeds, lined with fine rootlets, moss, and sometimes cotton; in many different locations, but usually in a deep bramble thicket, or hedge; as a rule they are located within ten feet of the ground, never on it, and have been seen built fifty feet above the earth. Eggs: 4 to 6, bluish-green, heavily freckled with several shades of brown.

Distribution.—Eastern United States; northward, regularly (but locally), to Maryland, southern Ohio, southern half of Indiana and Illinois, Missouri, etc., irregularly to Massachusetts, southeastern New York (Long Island, etc.), New Jersey, Pennsylvania, northern Indiana and Illinois, and Iowa, sporadically to Maine, Ontario, southern Wisconsin (breeding), and southern Minnesota; breeding and resident throughout its range, except where occurring accidentally; southward to southern Florida and along the Gulf to eastern Texas, and to the Bahamas; introduced into Bermuda (1893). Replaced in southwestern United States and Mexico by the Western Mockingbird.

Of all the songbirds in North America the Mockingbird is the most wonderful musician. Perhaps in his tones there is not such rich sweetness as is produced by the Hermit Thrush or the Winter Wren, but this is more than made up by the volume and marvelous variety of his singing. In addition to the Mockingbird's natural song he possesses the unusual power of imitating the notes of many other birds that he hears about him. The cry of the Catbird, the "killy-killy" shouting of the little Sparrow Hawk, the song of the Wren, the Bluebird, and the Robin are all given with a faithfulness of detail that must mislead many a bird, as they have often misled me.

The nest of the Mockingbird is built of sticks, twigs, rootlets and similar materials. The stalks and leaves of "rabbit-tobacco," a plant found commonly in the South, is much employed for this purpose. The nest is placed in trees, bushes, and vines of almost any character that offers protection from the view of the passer-by. If for any cause an occupied nest is destroyed, a new one will at once be made. On different occasions Mockingbirds have been known, when repeatedly disturbed, to build entirely new nests as many as four or five times in a single summer.

CATBIRD

DUMETELLA CAROLINENSIS (*Linnæus*)

A. O. U. Number 704

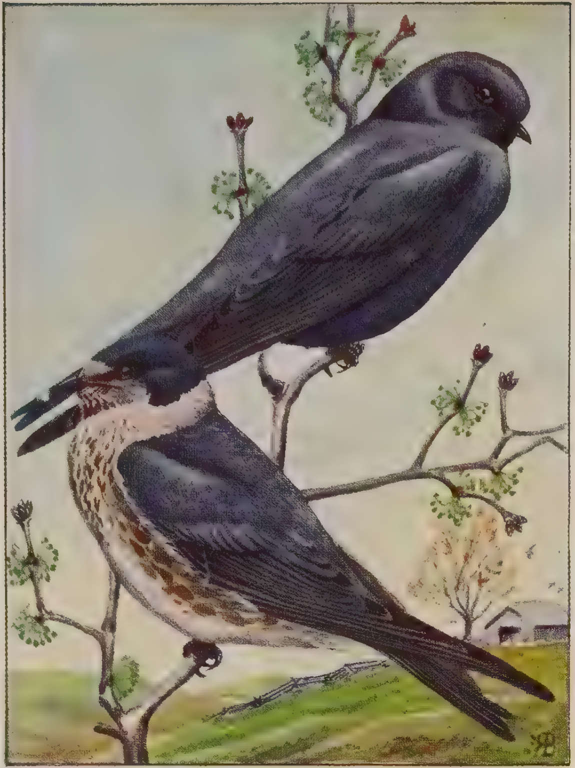
OTHER NAMES.—Chicken Bird; Cat Flycatcher; Slate-colored Mockingbird; Black-capped Thrush.

GENERAL DESCRIPTION.—Length, 8¾ inches. Plumage, slate-gray with black on crown, wings, and tail. Bill, much shorter than head, nearly straight to near tip, where gradually curved downward; wings, moderately long and rounded; tail, slightly longer than wing, decidedly rounded, the feathers narrowly rounded terminally.

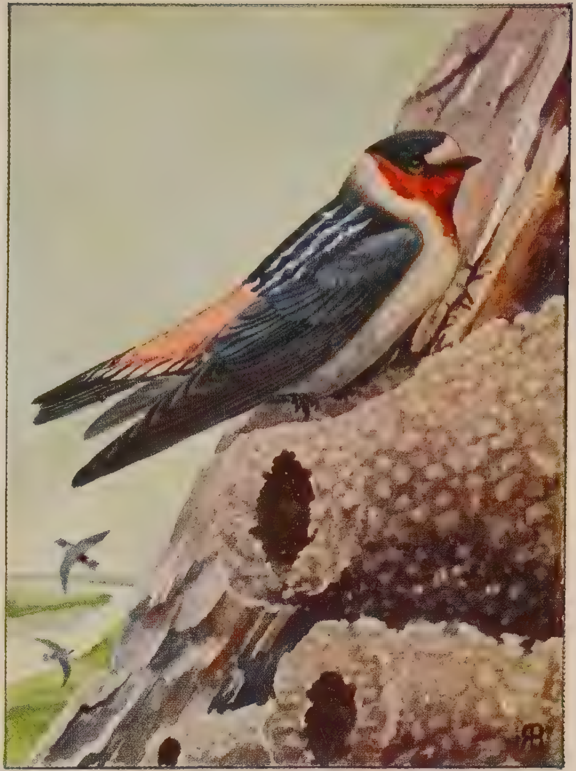
NEST AND EGGS.—Nest: Rather bulky, made of dry leaves, twigs, roots, and grasses, lined with rootlets and grass; placed in bushes, trees, or thickets usually within 10 feet of the ground. Eggs: 4 to 6, rarely latter number, plain, deep bluish-green, much darker colored than the Robin's.

DISTRIBUTION.—Temperate North America in general, but wanting in most of region south of the Columbia River and west of Rocky Mountains; north to Nova Scotia southern Maine, New Hampshire, Ontario, Manitoba, Saskatchewan, and British Columbia; west to and including Rocky Mountains, in Montana, Idaho, Wyoming, Colorado, New Mexico, and Utah, and in Oregon and Washington to the Pacific coast (accidentally to Farallon Islands, California); breeding southward to northern Florida and along Gulf coast to east-central Texas; wintering from Southern States (occasionally Middle States) southward to Bahamas, West Indies, and through eastern Mexico and Central America to Panama; resident in Bermuda; accidental in Europe.

THIS slaty-gray member of the Thrasher Family is one of the dozen most gifted feathered songsters of the eastern United States. Not everyone knows its song, however. for it has a habit of singing deep in its tangled retreat. It is a cautious, retiring bird, and only when it recognizes kind intentions on your part will it venture to make its abode in

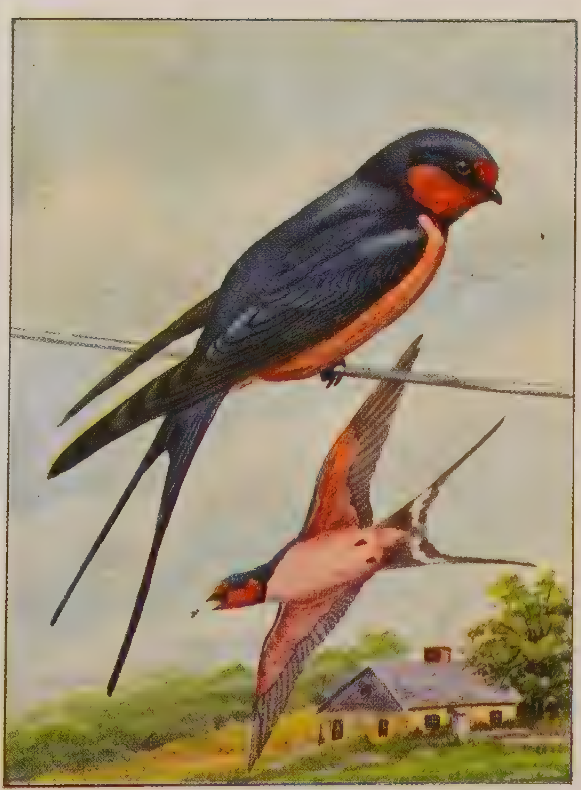


PURPLE MARTIN (1/2 nat. size)

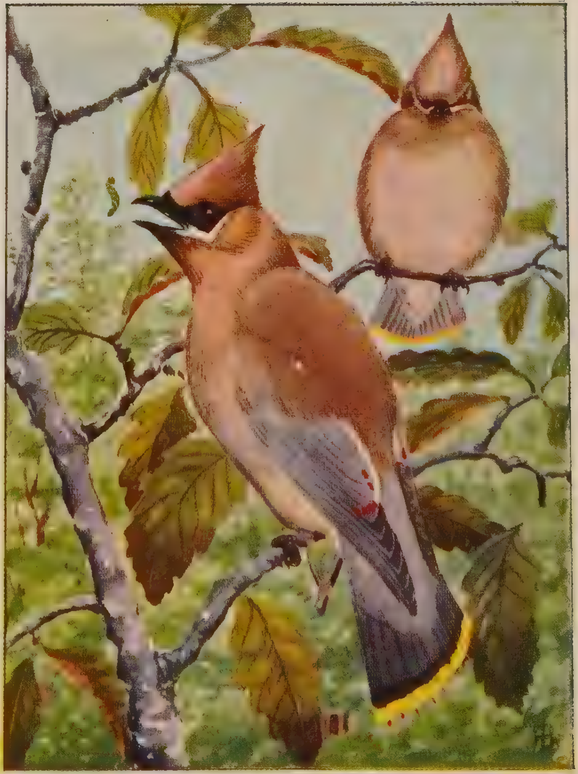


CLIFF SWALLOW (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER



BARN SWALLOW (1/2 nat. size)



CEDAR WAXWING (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

your shrubbery. Then, indeed, you may have it perch on the veranda railing, or awaken you at sunrise with its song. When alarmed, the bird has a cry much like the mewing of a cat, which has given it the name of Catbird.

Catbirds are partial to gardens and orchards, where they accomplish much good by eating vast numbers of harmful insects. In return for this service they are pretty sure to take a small share of the raspberries or strawberries as they ripen in your garden. Sometimes fruit-raisers, seeing the birds eat their fruit and failing to note the fact that they have helped to raise it, become much annoyed and loudly complain that the Catbird is a nuisance.

CATBIRD

Courtesy of American Museum of Natural History

When the nest, with its green eggs hidden in a brier patch or thick bush, is approached, both parents appear and show by their cries and actions the utmost alarm. On all occasions they are very devoted to their young.

Brown Thrasher

Toxostoma rufum (*Linnæus*)

A. O. U. Number 705

Other Names.—Thrasher; Brown Thrush; Red Thrush; Fox-colored Thrush; Sandy Mocker; Sandy Mockingbird; French Mockingbird; Brown Mocker; Brown Mockingbird; Ground Thrush; Mavis; Red Mavis; Song Thrush; Cane-bird.

General Description.—Length, 11 inches. Upper parts, brown; under parts, buffy streaked with dark. Bill about length of head, curved downward at the end; wings, rather short and rounded; tail, decidedly longer than wings and rounded.

Nest and Eggs.—Nest: In clusters of thorny vines, within a few feet of the ground, sometimes on it, occasionally in trees, seldom in open situations, out-of-the-way, quiet localities being preferred; a rather flat, loosely constructed structure exteriorly composed of twigs, rootlets, leaves, hair, together with some feathers. Eggs: 3 to 5, varying from pale greenish-white to pale buff, profusely speckled with minute spots of reddish-brown evenly over entire surface, more rarely forming a wreath around larger end.

Distribution.—Eastern United States and southeastern Canada; northward to southern Maine, Vermont, New York, northern Ontario, Manitoba, and Saskatchewan; breeding southward to northern Florida, Alabama, Mississippi, and eastern Texas, westward to base of Rocky Mountains in Montana, Wyoming, and Colorado; wintering from North Carolina, southeastern Missouri, etc. (more rarely farther northward), to southern Florida and south-central Texas; accidental in Arizona and Europe.

This is the bird often called the "Brown Thrush," and a very pretty poem about it "singing up in the tree" is known to many children. Although it does fly up into or usually *on to* a tree to sing, it passes most of the time on or near the ground. It dwells in the shrubbery of yards and gardens; and in regions where the birds are plentiful you are pretty sure to find one if you commence to examine the little thickets of brush or briers that grow up in old fields or disused pastures. The bird, as a rule, does not like the deep woods, although it is often seen along the border of the forest where there is plenty of sunlight.

The eggs generally are four in number, and the nest of sticks, twigs, and rootlets is placed in such places as thick vines, bushes, briers, or bush-piles, and in most cases is only a few feet from the ground.

Few birds surpass the Brown Thrasher in its power of song. Its notes are many, its voice is loud, and the singing is often prolonged throughout most of the morning. It belongs to a famous family of singers, which includes the Catbird and that world-renowned songster, the Mockingbird.

House Wren

Troglodytes aëdon aëdon (*Vieillot*)

A. O. U. Number 721

Other Names.—Brown Wren; Common Wren; Wood Wren; Stump Wren; Short-tailed House Wren; Jenny Wren.

General Description.—Length, 5 inches. Upper parts, brown; under parts, white and grayish-brown. Bill, shorter than head, straight or but very slightly curved downward, tapering gradually; wings, moderate in length, rounded; tail, about length of wing, much rounded, the feathers narrow with rounded tips.

Nest and Eggs.—Nest: Usually in boxes erected by man for their convenience, under house cornices and eaves, in fact almost anywhere, from the pocket of a scarecrow to an old tin can on the ground; constructed of small twigs, grass, feathers, spiders' webs, and lined with soft strips of bark, down, or feathers. Eggs: From 6 to 8, dull white, so profusely spotted with reddish or pinkish brown as to obscure the ground color.

Distribution.—Eastern United States and Canada; breeds north to New Brunswick, Maine, Ontario, Michigan, and eastern Wisconsin, and south to Virginia and Kentucky; winters in the South Atlantic and Gulf States, and through eastern Texas to eastern Mexico. Replaced in western North America by the Western House Wren.

This Wren has been rightly named, for it is very fond of being in the immediate vicinity of a house or other building, and in the spring is rarely found elsewhere. It loves the shrubbery of the yard and the shelter of vines, bushes, or other vegetation of the garden. Its nest will be built in a bird-box if it can find one, or in an old gourd hung up some place, or in the crevice of a building or tree. It is made of twigs, feathers, grass, weed-stalks, or almost any other soft material that may easily be secured. The amount of these things used by the birds depends entirely upon the size of the cavity selected for the nest, for they have a way of filling the hole until there is left just room enough for the eggs and for the parents to go in and out. In the Southern States, where these birds retire to pass the winter, you may see them about buildings or in the deep woods or even swamp-lands.

The House Wren's song is astonishing both in its loudness and quantity. The fast bubbling music seems to possess his whole being, and the little fellow trembles visibly as perched on some limb or stake he sings with a power and sweetness that attract universal attention.

WINTER WREN

NANNUS HIEMALIS HIEMALIS (*Vieillot*)

A. O. U. Number 722

OTHER NAMES.—Wood Wren; Mouse Wren; Spruce Wren; Short-tailed Wren.

GENERAL DESCRIPTION.—Length, 4 inches. Upper parts, reddish brown; under parts, pale wood-brown, speckled with dusky. Bill, shorter than head, very slender, and awl-shaped; wings, short and rounded; tail, $^2/_3$ length of wing, much rounded, the feathers narrow with rounded tips.

NEST AND EGGS.—Nest: In cavity of stump, or among roots of upturned tree; constructed of small twigs, plant stems, moss, and lichens woven together and warmly lined with moss, fur, hair, and feathers, with a small circular opening. Eggs: 5 to 7 or 8, creamy-white, minutely dotted with reddish-brown and lavender.

DISTRIBUTION.—Eastern United States and Canada; north to Nova Scotia, Prince Edward Island, New Brunswick, Quebec, Ontario, and Manitoba; breeding southward to Massachusetts, New York, Michigan, and Wisconsin, more rarely to northern Indiana and Illinois and central Iowa, and through mountain districts of Pennsylvania, Maryland, Virginia, and West Virginia to western North Carolina; wintering from near southern breeding limit to northern Florida and thence along the Gulf coast as far as Texas.

LOOK for the Winter Wren in the brier tangle at the back of the garden, or on one of the lower rails of an old fence skirting a country road. In the wood, any old stump, brush pile, or fallen tree may serve as its hiding place. Flitting close to the ground from one cover to another it may even be mistaken for a mouse. Its brown coat, secretive movements, and the quickness with which it dodges out of sight, all tend to suggest this little furry rodent.

One way in which it may be told from the House Wren, which it much resembles, is by its darker plumage.

Aside from a little scolding chatter we do not hear much from the Winter Wren during the cold months. In spring, however, it is one of the most wonderful songsters of the land. Its song is long, varied, and is of wonderful sweetness. Mounting to the top, or near the top, of a tree in the evergreen forests where the birds spend their summer, the little male will pour forth a perfect torrent of exquisitely beautiful notes. At this season, Winter Wrens are found in the northern tier of States and Canada. Others inhabit the mountain tops as far south as North Carolina.

Long-Billed Marsh Wren

Telmatodytes palustris palustris (*Wilson*)

A. O. U. Number 725

Other Names.—Marsh Wren; Reed Wren; Cat-tail Wren; Salt-water Marsh Wren,

General Description.—Length, 5 inches. Upper parts, brown and black with white streaks; under parts, white and pale brown. Bill, shorter than head, slender, gently curved for most of its length; wings, moderate in length and much rounded; tail nearly as long as wing, much rounded, the feathers not tapering and with broadly rounded tips.

Nest and Eggs.—Nest: A remarkable cocoanut-shaped structure of interwoven reeds, strongly fastened to upright sedges or cat-tails, lined with fine grass and cat-tail down, with side entrance and nearly waterproof. Eggs: 5 to 9, chocolate, generally sprinkled with deeper colored specks and spots.

Distribution.—Eastern United States, chiefly east of the Allegheny Mountains; north to Massachusetts and New York; west to western New York and Pennsylvania; breeds southward to the Potomac valley and Atlantic coast of Maryland and Virginia; in winter southward to North and South Carolina, occasionally to western Florida, occasionally wintering in northern portions of its range. In other parts of United States and Canada five other sub-species of the Long-billed Marsh Wren are to be found.

LONG-BILLED MARSH WREN BRINGING FOOD TO YOUNG

The Long-billed Marsh Wren is pre-eminently a bird of the salt marshes. Here it lives throughout the summer, and its presence adds greatly to the life of wide reaches of more or less desolate territory. It is a wonderful singing bird, and as it lives where extremely few other birds ever sing, it must be depended on to furnish most of the marsh-land music. Its explosive bubbling song cannot be heard very far, except on still days, yet the bird has a way of singing while up in the air, and this makes it more noticeable than if it kept hidden in the grassy retreats. While perched on some slender stalk the song begins, and the volume of it seems to lift the bird in the air. Up, up, it rises, four, six, ten feet until the song runs its course and the bird drops out of sight. To look over a marsh of many acres some quiet June day and see these birds rising and falling in all directions, while countless little songs float to one's ears, is an experience not soon forgotten.

The nest for the heavily brown-spotted eggs is woven among the blades of the marsh grass from one to three feet above high tide. It looks like a ball of dried grass with the entrance hole in the side. Many nests are built, but only one is used. Perhaps the others serve to mislead some enemy, or it may be the male makes all these extra ones simply from an excessive love of nest-building.

BROWN CREEPER

CERTHIA FAMILIARIS AMERICANA *Bonaparte*

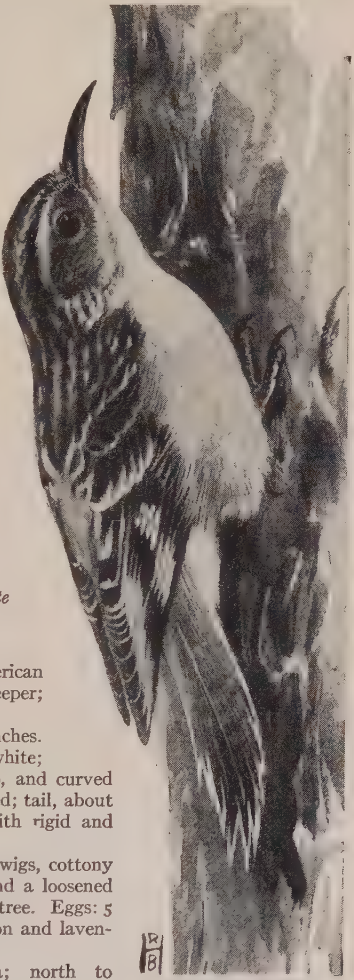
A. O. U. Number 726

OTHER NAMES.—Common Creeper; American Creeper; American Brown Creeper; Tree Creeper; Little Brown Creeper.

GENERAL DESCRIPTION.—Length, 5¾ inches. Upper parts, brown with streaks of grayish-white; under parts, dull white. Bill, slender, sharp, and curved downward; wings, moderate in length, rounded; tail, about length of wing, graduated; the feathers, with rigid and sharp tips.

NEST AND EGGS.—Nest: A collection of twigs, cottony fibers, bark strips, and feathers, placed behind a loosened section of bark, nearly always in a balsam fir tree. Eggs: 5 to 8, white or creamy, freckled with cinnamon and lavender specks, often wreathed around large end.

DISTRIBUTION.—Eastern North America; north to Ontario, Manitoba, etc. (probably to southern Labrador and southwestern shores of Hudson Bay), west to eastern portion of the Great Plains; breeding southward to Massachusetts, New York, northern Indiana, southeastern South Dakota, and southeastern



BROWN CREEPER

FROM A DRAWING BY R. BRUCE HORSFALL

Missouri and along higher Alleghenies to mountains of North Carolina (above 4,000 feet); wintering over a large part of its breeding range and south to northern Florida and central Texas.

WITH infinite patience the Brown Creeper works his way up and around the side of a tree. Into every crack and cranny he peeps for insects or their eggs. In appearance he is brown mixed with a little white. His tail is long and slightly curved. He does not look like any other bird you know, and his movements are also of a kind that are all his own. After reaching a point on the tree well up among the limbs he suddenly flies to the bottom of another tree and begins his upward climb all over again.

In the far northern woods, where the Brown Creeper retires in spring to seek his mate, we are told that he sings a very sweet and tender song, but in winter, or during the migration periods when most of us see him, he seems to possess no note, but a little squeak that could not, with any degree of truthfulness, be called a song.

The Brown Creeper has a place for building its nest all its own, too. Rarely does any other bird risk using such a situation. Behind the loose bark of a decaying tree that is already in process of falling apart the cradle is made and the spotted eggs are laid.

WHITE-BREASTED NUTHATCH

SITTA CAROLINENSIS CAROLINENSIS *Latham*

A. O. U. Number 727

OTHER NAMES.—White-bellied Nuthatch; Carolina Nuthatch; Common Nuthatch; Sapsucker (incorrect); Tree-Mouse; Devil Downhead.

GENERAL DESCRIPTION.—Length, 6 inches. Upper parts, bluish-gray and black; under parts, white.

NEST AND EGGS.—Nest: Usually in a dead stump or tree from 2 to 60 feet up, sometimes in a deserted Woodpecker hole; loosely constructed of soft felted rabbits' fur, leaves, feathers, and hair. Eggs: 5 to 8, white or pinkish-white, spotted with chestnut and a few lavender specks.

DISTRIBUTION.—Eastern North America; north to New Brunswick and northern Ontario; west to eastern edge of Great Plains; south to Georgia and Gulf States (except coast belt). Replaced in other parts of North America by related varieties.

IN CERTAIN ways the Nuthatch reminds one of both the Chickadee and Woodpecker. Like the former, he often hangs head downward, and like the latter, clings and hops along the trunks of trees. His usual note is "yauk, yauk!" uttered in a peculiar way somewhat as though the bird was talking through its nose. It lives in large part on insect eggs, or the larvæ of insects it finds hidden in the crevices of the bark. In winter it will come near the house, and perhaps learning from the Chickadee's actions just where you have placed the suet for the birds, will quickly claim his share. At this season he wanders about the woods and orchards with his friends, the Downy Woodpecker and Chickadee.

In spring the White-breasted Nuthatch selects a mate, and together they seek a place for their nest. No longer do they travel about with their winter friends. These are now forgotten, for many interesting and important duties must receive attention. After much hunting a place to hide the nest is chosen. It is always built in a hole of some tree or stump, or possibly a bird box. Sometimes the place selected is forty or fifty feet from the ground, and again it may be a cavity not over a foot above the grass. The nest is made of leaves and grass. Feathers are often added, if the little searchers are so fortunate as to find them.

Tufted Titmouse

Bæolophus bicolor (*Linnæus*)

A. O. U. Number 731

Other Names.—Tufted Tit; Tufted Chickadee; Crested Titmouse; Peto Bird; Crested Tomtit.

General Description.—Length, 6 inches. Upper parts, slate-gray; under parts, white and reddish. Bill, short and stout; wings, long and rounded; tail, shorter than wing, slightly rounded; head, with crest.

Nest and Eggs.—Nest: Usually in deserted Woodpecker holes or hollow stumps; a collection of moss, leaves, bark strips, and horse and cattle hair. Eggs: From 5 to 8, white, thickly spotted with reddish-brown.

Distribution.—Eastern United States; north, regularly, to southern Pennsylvania and New Jersey, central Ohio, northern Indiana, northern Illinois, southern Iowa, and northeastern Nebraska; irregularly or casually to Connecticut, southern New York (Long Island, Staten Island), extreme northern portions of Indiana and Illinois, and southern Minnesota; west to eastern portion of the Great Plains; south to the Gulf coast, including south-central Florida and eastern and central Texas.

"Pe-toe, pe-toe, pe-toe!" the Titmouse sings over and over at intervals the livelong day. Usually the notes come ringing through the woodland with great clearness, and one knows that the bird is filled with energy and good spirits. Again the calls seem sad and lack brightness, as though the singer was very weary, and was only calling because he was forced to sing a certain number of times each day. Of course, the bird has some other notes, but these are not heard so often.

In the southern woods where the Tufted Titmouse lives it is found often in winter with Chickadees, Nuthatches, and a Downy Woodpecker or two. These birds form into little troops and feed together throughout the day, each giving its own call from time to time, and the whole making a very happy and contented feathered band.

Probably they do not sleep together, although all of them usually roost in old Woodpecker holes or natural cavities of trees. Such a place is also chosen by the Titmouse for making its nest when spring comes.

You may know this little southerner by its song, its gray coat, and its feathered crest that it raises and lowers at will.

CHICKADEE

PENTHESTES ATRICAPILLUS ATRICAPILLUS (*Linnæus*)

A. O. U. Number 735

OTHER NAMES.—Common Chickadee; Eastern Chickadee; Black-capped Chickadee; Black-capped Titmouse; Black-capped Tit.

GENERAL DESCRIPTION.—Length, 5¼ inches. Upper parts, gray with a black cap; under parts, white with a black throat. No crest; bill, shorter than head; wings, long and rounded; tail, shorter than wing, slightly rounded.

NEST AND EGGS.—Nest: In deserted Woodpecker holes, natural cavities, old stumps (preferably white birch), or fence posts; such openings are filled with leaves, moss, grasses snugly lined with hair, fur from small animals, and feathers. Eggs: 4 to 8, white, spotted with chestnut and lilac-gray.

DISTRIBUTION.—Eastern North America; north to Newfoundland, Quebec, Ontario, and southern Keewatin; south, regularly, to about latitude 40°, in New Jersey, Pennsylvania, Ohio, northern Indiana, northern Illinois, Iowa, etc., in Allegheny Mountains to North Carolina (in spruce belt); irregularly (in winter) to northern Virginia, Kentucky, southern Illinois, Missouri, etc. Other species and sub-species found in other parts of North America.

As a rule, we see the Chickadee most often during the cold months of the year. In summer, when all the bird-world is filling the air with song and flashes of plumage, he may be overlooked. When frost has stripped the trees of the leaves, and sent most of the feathered songsters scurrying for sunny climes, the Chickadee is more readily seen and heard. "Chick-a-de-de-de!" he sings. If you do not know him, look for a little gray bird about five and a quarter inches in length. He is whitish beneath and wears a black cap. Among the small twigs of the limbs he is hopping, and flitting, and clinging, as he searches for insect eggs. Again he will descend to the low bushes, and will come so near that you could almost reach him with your hand. In fact, Chickadees have been known to light on the hands of many people who were careful not to frighten them.

If suet is tied to limbs or posts in the yard, the Chickadee is pretty sure to be one of the birds to discover it. Day after day, and several times each day, he will come to enjoy the feast you have spread for him Winter would lose much of its charm if the Chickadee did not stay with us.

GOLDEN-CROWNED KINGLET

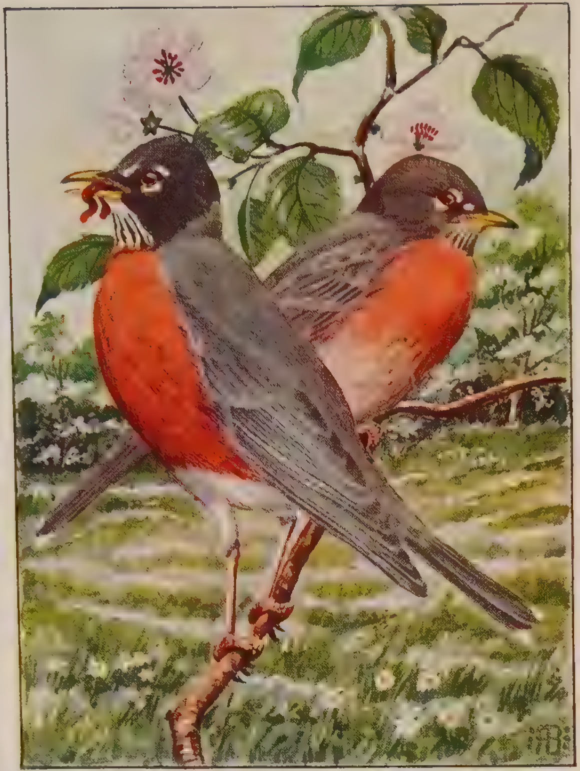
REGULUS SATRAPA SATRAPA *Lichtenstein*

A. O. U. Number 748

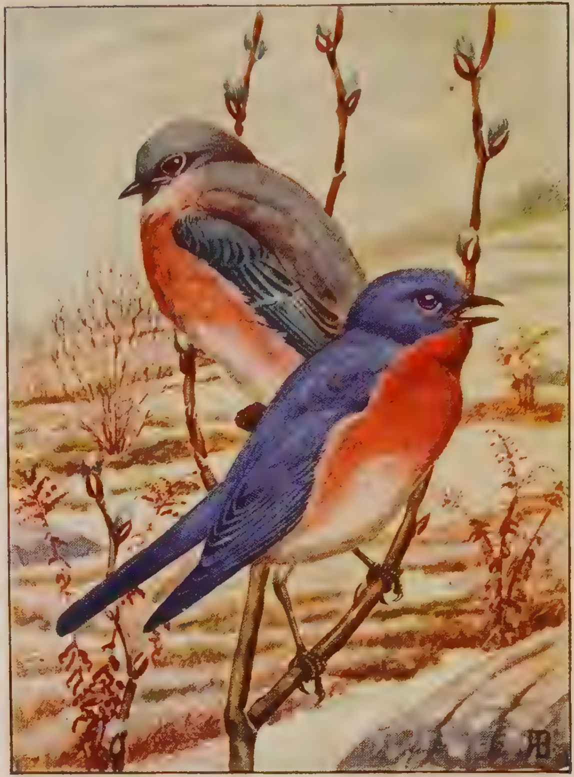
OTHER NAMES.—Golden-crested Kinglet; Golden-crowned Wren; Flame-crest; Fiery-crowned Wren; Gold-crest.

GENERAL DESCRIPTION.—Length, 4½ inches. Upper parts, gray; under parts, olive-whitish.

NEST AND EGGS.—Nest: Spherical, about four and a half inches in diameter, composed

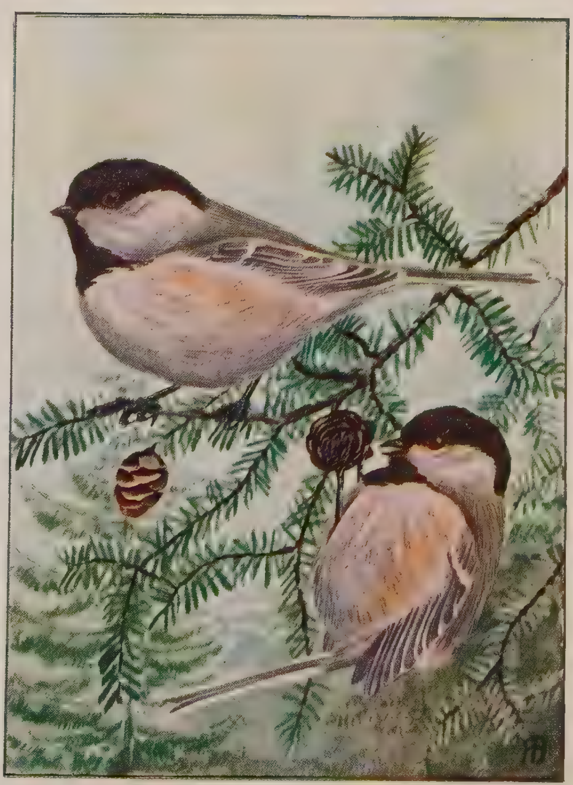


ROBIN (3/8 nat. size)

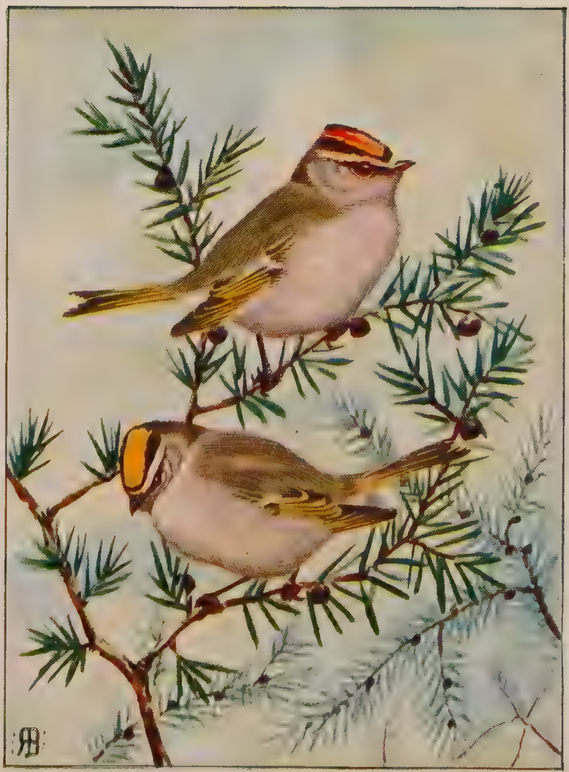


BLUEBIRD (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

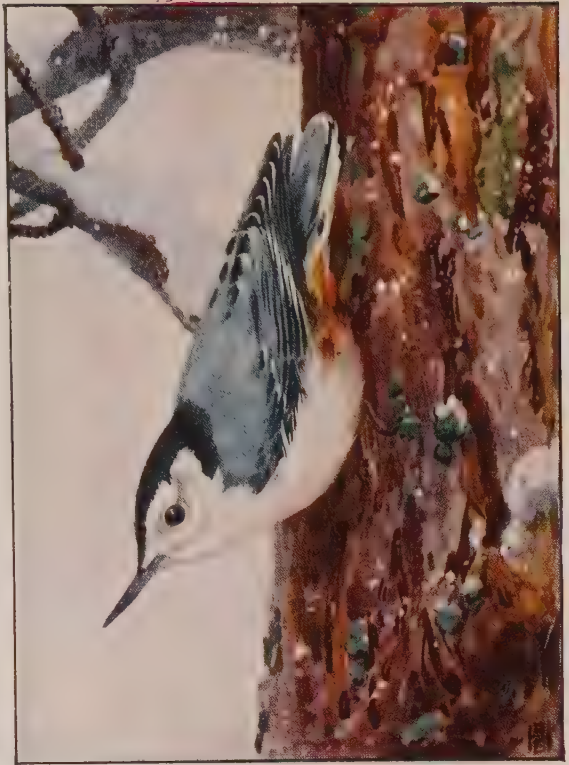


CHICKADEE (3/5 nat. size)

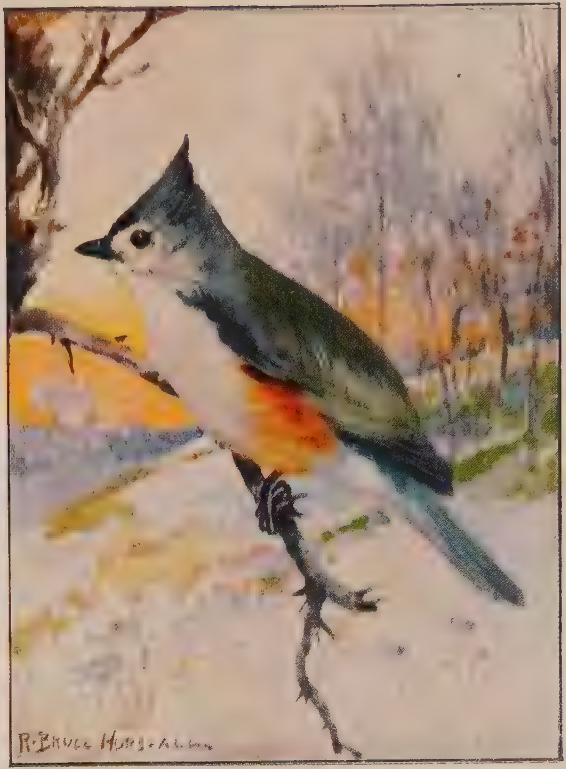


GOLDEN-CROWNED KINGLET (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER

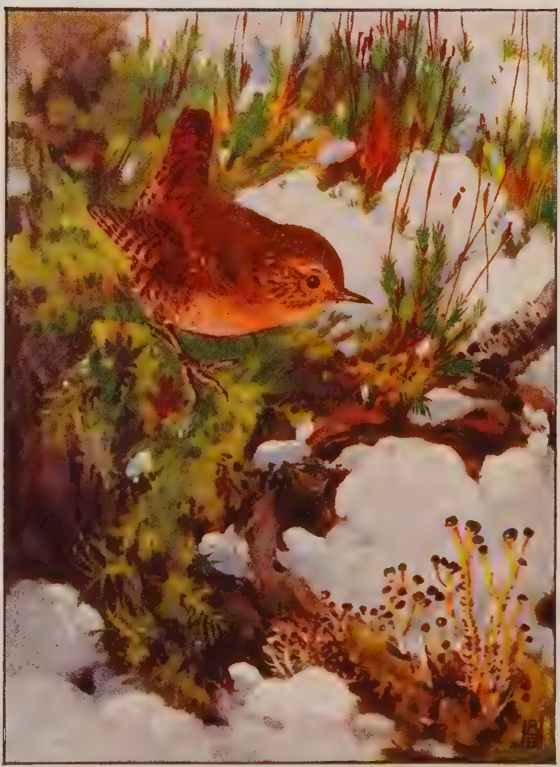


WHITE-BREASTED NUTHATCH (1/2 nat. size)

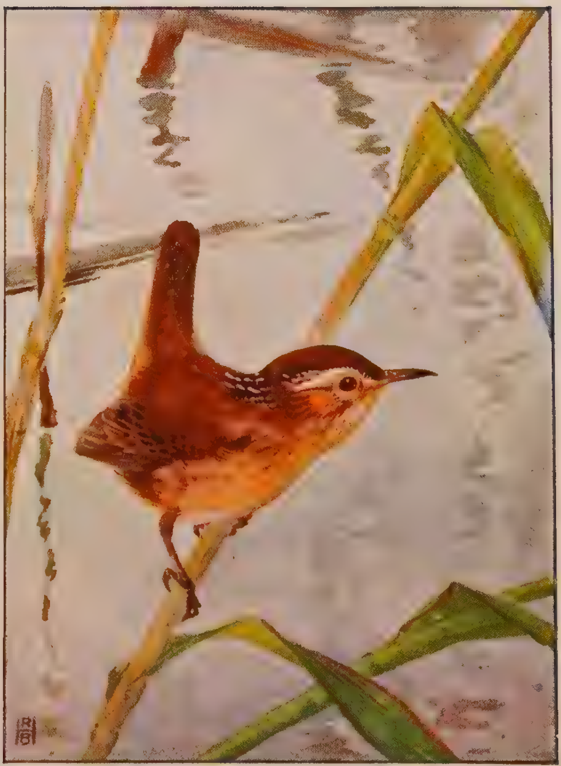


TUFTED TITMOUSE (1/2 nat. size)

FROM DRAWINGS BY R. BRUCE HORSFALL



WINTER WREN (1/2 nat. size)



LONG-BILLED MARSH WREN (1/2 nat. size)

FROM DRAWINGS BY R. BRUCE HORSFALL

exteriorly chiefly of green moss, lined with fine strips of bark and fine rootlets, surmounted by numerous feathers of various wild birds, arranged with points of quills downward and forming a screen that effectually conceals the eggs; semi-pensile or not, being sometimes supported beneath and sometimes fastened by top and sides to the needles of the coniferous tree in which it is usually placed, generally at a height 50 to 60 feet from the ground. Eggs: 5 to 10, varying from creamy-white to buff, sprinkled with numerous spots or blotches of pale brown, chiefly around larger end, and placed in the nest cavity in a double layer, as the space is too small to hold them in one.

DISTRIBUTION.—North America east of Rocky Mountains; north to Labrador, Keewatin, etc.; breeding southward to Massachusetts, central New York, northern Michigan, northern Minnesota (?), etc., and along Allegheny Mountains to western North Carolina (in spruce belt); wintering southward to northern Florida, and westward along Gulf coast to south-central Texas. In western North America replaced by the Western Gold-crowned Kinglet.

THIS bird is well described by its name, for "Kinglet" means little king. It has a crown of golden-colored feathers, and as it is only about one-quarter of an inch longer than the Ruby-throated Hummingbird, it is certainly correct to call it a little king.

Most of us are accustomed to see this exquisite feathered mite between the months of September and May. Look for it climbing and flitting about the ends of evergreen boughs. It may be sixty feet from the earth, but often you will find it on a level with your face. It is very gentle, and not easily frightened away. Sometimes it will come within a few feet of the boy or girl who is watching its movements.

The male has a very sweet song in the spring and summer, and it is so loud that upon hearing it for the first time one might well suppose it issued from the throat of a much larger bird.

In the nesting season the Golden-crowned Kinglet is found in the pine forests of the northern States and Canada, or on the high mountains of the South. Closely related to it, and but one-third of an inch longer, is the Ruby-crowned Kinglet, which has the same general habits of life.

WOOD THRUSH

HYLOCICHLA MUSTELINA (*Gmelin*)

A. O. U. Number 755

OTHER NAMES.—Song Thrush; Wood Robin; Bell Bird; Swamp Robin.

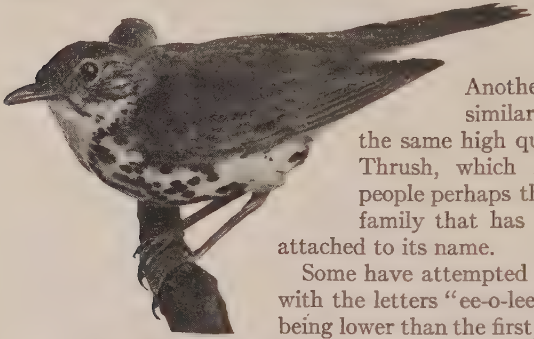
GENERAL DESCRIPTION.—Length, 7¾ inches. Upper parts, brown; under parts, white, spotted. Bill about ½ length of head, slender, curved downward at the tip; wings, long and pointed; tail, not more than ¾ length of wing, even, the feathers slightly sharpened at the extreme tip; legs, long and slender.

NEST AND EGGS.—Nest: Usually in thickets, placed in the crotch or on horizontal limbs of saplings, six to twelve feet from ground; composed externally of leaves, grasses, small twigs, and stems placed when damp and cemented with mud, the whole quite firm and solid when dry; bits of paper or rag are frequently added as a sort of decoration; the lining formed of fine rootlets and grasses. Eggs: 3 or 4, plain greenish-blue.

DISTRIBUTION.—Eastern temperate North America; north to New Hampshire

(White Mountains), New York (breeding at Lake George), northern Ontario, northern Michigan, etc., accidentally to Maine and northeastern New York; west to middle portion of Great Plains (along wooded valleys); breeding southward to northern Florida and thence westward through Gulf States to eastern Texas; in winter southward through eastern Mexico and Central America to Nicaragua and Costa Rica, also to Bahamas, Cuba, Jamaica, and Porto Rico; straggler to the Bermudas.

Thrushes are famous singers wherever found. In North America, by common consent, the palm is yielded to the Hermit Thrush as being the sweetest and most spirited of all the Thrush musicians. Another whose song is very similar, and has much of the same high qualities, is the Wood Thrush, which is known to more people perhaps than any other of the family that has the word "thrush" attached to its name.



WOOD-THRUSH

Courtesy of American Museum of Natural History

Some have attempted to describe its song with the letters "ee-o-lee-e," the second note being lower than the first, and the third much louder and more prolonged than either of the others. It is heard at all times of day, but mainly in the morning and evening. The Wood Thrush feeds much on the ground, but rises to the high limbs of trees in the woods or groves to fling its beautiful notes to the wind. "Swamp Robin," some people call it. Others know it as the "Wood Robin."

The nest with its three or four greenish-blue eggs may be looked for in a low tree eight or ten feet from the ground. Large leaves and sometimes pieces of paper are placed among the weed stalks and sticks with which it is made, and like a Robin's nest, it is given strength by a mud cup. The Wood Thrushes all leave the United States when autumn comes.

ROBIN

PLANESTICUS MIGRATORIUS MIGRATORIUS (*Linnæus*)

A. O. U. Number 761

Other Names.—Fieldfare; Common Robin; Robin Redbreast; Redbreast; Migratory Thrush; Canada Robin; Northern Robin; American Robin.

General Description.—Length, 10 inches. Head, black; upper parts, gray; under parts, reddish and white. Bill, decidedly shorter than head, compressed, terminal $^2/_3$ gradually and increasingly curved downward; wings, rather long and pointed; tail, shorter than wing, even or slightly rounded, the feathers broad.

Nest and Eggs.—Nest: A thick but symmetrical bowl, made of mud re-enforced with leaves and twigs, in which are frequently woven leaves, twine, paper, and rags. It is lined with soft grass, and may be placed (frequently quite near the ground) in any kind of tree or upon any suitable projection from a house, or within or without barns, sheds, and other outbuildings. Eggs: 4 or 5 (occasionally 6), greenish-blue, unmarked; usually two broods a season and sometimes three.

Distribution.—Eastern and northern North America; breeding from the southern Alleghenies (in western North Carolina, etc.), Pennsylvania, New Jersey, the New England States, Ohio, central and northern Indiana and Illinois, Iowa, northward to the limit of tree growth in Ungava (Fort Chimo), and northwestward to the valley of Kowak River in northwestern Alaska; westward nearly to the Rocky Mountains (to the Pacific at Cook Inlet, Alaska); in winter southward to southern Florida and along the Gulf coast to Texas; accidental or occasional in the Bermudas and Cuba; accidental in Europe (as escapes from captivity?). In western North America replaced by the Western Robin, in southeastern United States by the Southern Robin.

The best-known bird in North America is the Robin, also it is the most beloved. Now and then some man gets angry because a Robin eats his cherries, but the bird is now protected everywhere by strong laws. In the Southern States especially a few are still shot for food, despite the law. Robins do not sing in that part of the country, and as they go about in flocks and become very fat from eating berries of the black gum, palmetto, etc., they present very tempting targets for the hungry hunter. In some places they gather to roost by untold thousands, and these great Robin roosts were, until very recently, famous places for hunters to kill them.

In summer this bird is found over a large part of the continent as far north as Alaska. It is very sociable, and likes to be about the home of man. Often the first bird to arrive from the South in spring is the Robin. Its song, made up of a few cheerful notes, salutes you on the day when there is in the air the first indication of approaching warmth. Soon others arrive, and before long the lawn is plentifully sprinkled with the new red-breasted arrivals. At this season they are very fond of eating angle-worms, and this brings them to the yard and garden in great numbers.

BLUEBIRD

SIALIA SIALIS SIALIS (*Linnæus*)

A. O. U. Number 766

Other Names.—Eastern Bluebird; Wilson's Bluebird; Blue Robin; Common Bluebird; Blue Redbreast; American Bluebird.

General Description.—Length, 7 inches. Upper parts, bright blue; under parts, cinnamon-chestnut and white. Bill, small and slender; wings, long and pointed; tail, shorter than wings, distinctly notched; legs, short.

Nest and Eggs.—Nest: The natural nesting-sites are in deserted Woodpecker holes, hollows of decayed trees, or crevices of rocks; it was one of the first birds to take advantage of "modern conveniences" and quickly appropriated boxes placed around the farm houses for its occupancy; hollows in old rail fences are often used, and in some parts of New England a large percentage of nests are so located; more rarely the pair usurp a Swallow's nest; the nest is composed of grass, weed stalks, a few bits of bark, and lined with finer grass-blades. Eggs: 4 to 6, rarely 7 and usually 5, plain light bluish-white in color.

Distribution.—United States and southern Canada east of Rocky Mountains; north to Nova Scotia, southern New Brunswick, southern Maine, Vermont, northern New York (Adirondacks), northern Ontario, and Manitoba, occasionally to northern New Brunswick, northern Maine and southern Quebec; west to eastern base of Rocky Mountains, in Montana, Wyoming, and Colorado; breeding southward to southern Florida and along the Gulf coast to southern and west-central Texas; Bermudas (resident); accidental in Cuba.

The Bluebird is one of our best-known and most beloved birds. Its blue coat and brick-red vest are familiar to every child who lives where wild birds may be seen and studied. One of the earliest birds to appear in spring, it is not until most certain indications of winter are in the air that it again departs for more southern climes.

The Bluebird is distinctly a bird of the open country, and is equally at home on a post by the roadside, or perched on a stake in the garden. In winter, however, one meets with them in flocks as they drift about through the southern pine woods and along the borders of swamps in quest of wild berries that grow so abundantly in those regions.

The cradle for the young Bluebirds is made of grass, and is carefully hidden away in the natural cavity of an old orchard tree, an unused Woodpecker hole, or in a box erected by some kindly friend of the birds. One odd thing about the eggs is that while usually they are bluish-white in color, it is not uncommon to find nests in which all of them are pure white.

A BUCCANEER IN FEATHERS

How that Conscienceless Freebooter of the Woods, the Butcher-Bird, or Shrike, Makes War on his Neighbors

By JOHN BURROUGHS

ONE day as I sat at my desk I caught a glimpse of swiftly moving wings about the trunk of a large maple that stands in front of my window. A second glance showed me a shrike, or butcher-bird, pursuing some small bird around the tree. Rushing to the door I saw that the pursued was a brown creeper, and that the little bird was taxing its wit and its wings to the utmost to avoid being seized by the shrike. Its obvious tactics were to keep to the trunk of the tree between it and its enemy.

As the creeper spends most of its time on the trunks of trees seeking its minute food, it is entirely at home there. Its protective coloration, as it is called, is supposed to be of great service in concealing it from its enemies, but it seemed to avail it little in the present case.

When the shrike lost sight of it for a moment as it darted around the tree trunk, he began exploring the tree all the way to the top. Then he dropped down to near the bottom, and in so doing started the creeper from its place of hiding. It came quickly on my side of the tree and stopped, clinging to the bark where it was partly shielded and hidden by a rope attached to a hammock. There it crouched motionless and, I fancied, trembling for its life. The shrike has not the talons of the bird of prey, and hence it cannot strike its quarry as the hawk can. Its weapon is its slightly hooked beak. With this it breaks the skulls of its victims and then sups upon their brains. The little creeper acted as if it knew all this, but I suppose all it knew was that a large bird with a murderous instinct was hotly pursuing it.

The shrike in its search now alighted upon the hammock; this act caused the rope to move that partly concealed the creeper, and away it flew, no doubt in a panic of fear. The shrike saw it and gave chase, but before I could get into the open where I could see the issue, both birds had disappeared, nor could I see a feather of either anywhere on the ground or among the trees of the neighborhood. I think the creeper escaped, though I thought his leaving the maple was very bad tactics.

My son and I once witnessed a little bird tragedy which showed how fatal it is for one of our smaller birds to seek to escape from the murderous shrike by open flight. I had just stepped out of my study door and was gazing out upon the white landscape, when my son, who was passing by a woven wire fence, about fifty yards away, with a piece of timber upon his shoulder, called out to me, "See those birds." Two birds, one in hot pursuit of the other, had struck the woven wire fence at his elbow, had struggled through the meshes, and went racing through the vineyard in my direction. I saw them coming down between two rows of grape vines in desperate flight. I saw at a glance that it was a shrike pursuing a junco, or snow bird, and that the assassin was gaining on his victim. As they got opposite me and about forty yards below me, the junco, finding its enemy dangerously near, turned its course sharply to the right, crossing the line of wires supporting the vines.

Then just what happened, or rather just how the deed was done, my eye was not quick enough to see, but the shrike struck his victim down, probably with his beak, and fell with it to the ground. I rushed to the rescue as fast as possible, but before I could reach the spot, the shrike had killed his victim, carried it to the top of a grape vine, tightened his hold, and was off down the hill toward a line of trees, with its limp form hanging beneath him. There was the imprint in the snow where the birds had fallen, but not a feather or a drop of blood to tell of the tragedy that had been enacted there.

Later in the winter, while trimming the grape vines, I heard a bird scream, and looking in the direction saw that a robin was being hotly pursued by a shrike. The robin was darting in and about a spruce tree, screaming his protest and leaving a trail of feathers behind where the shrike struck him. Presently, still shouting his protests, he left the shelter of the spruces and disappeared over the hill, closely pursued by the shrike. What the final issue was no one knows. I had not supposed that the shrike ever attacked so large a bird as the robin. He certainly could not carry away a bird of more than his own weight, though he might kill it by a blow upon its head, as he probably did in this case.

The wild life about us is full of tragedies, both winter and summer. Many of the records upon the snow tell a story of only fear or pain.

BIRD-NESTING TIME

By JOHN BURROUGHS

THE other day I sat for an hour watching a pair of wood thrushes engaged in building their nest near "Slabsides." I say a pair, though the female really did all the work. The male hung around and was evidently an interested spectator of the proceeding. The mother bird was very busy bringing and placing the material, consisting mainly of dry maple leaves which the winter had made thin and soft, and which were strewn over the ground all about. How pretty she looked running over the ground, now in shade, now in sunshine, searching for the leaves that were just to her fancy! Sometimes she would seize two or more, and with a quick, soft flight bear them to the fork of the little maple sapling. Every five or six minutes during her absence, the male would come and inspect her work. He would look it over, arrange a leaf or two with his beak, and then go his way. Twice he sat down in the nest and worked his feet and pressed it with his breast, as if shaping it. When the female found him there on her return, he quickly got out of her way.

But he brought no material, he did no needful thing, he was a bird of leisure. The female did all the drudgery, and with what an air of grace and ease she did it! So soft of wing, so trim of form, so pretty of pose, and so gentle in every movement! It was evidently no drudgery to her; the material was handy, and the task one of love. All the behavior of the wood thrush affects one like music; it is melody to the eye as its song is to the ear; it is visible harmony. This bird cannot do an ungraceful thing. It has the bearing of a bird of fine breeding. Its cousin, the robin, is much more masculine and plebeian, harsher in voice, and ruder in manners. The wood thrush is urban, and suggests sylvan halls and courtly companions. Softness, gentleness, composure, characterize every movement.

In only a few instances among our birds does the male assist in nest-building. He is usually only a gratuitous superintendent of the work. The male oriole visits the half-finished structure of his mate, looks it over, tugs at the strings now and then as if to try them, and, I suppose, has his own opinion about the work, but I have never seen him actually lend a hand, and bring a string or a hair. If I belonged to our sentimental school of nature writers I might say that he is too proud, that it is against the traditions of his race and family; but probably the truth is that he doesn't know how; that the nest-building instinct is less active in him than in his mate; that he is not impelled by the same necessity. It is easy to be seen how important it is that the nesting instinct should be strong in the female, whether it is or not in the male. The male may be cut off and yet the nest be built and the family reared. Among the rodents, I fancy the nest is always built by the female.

Whatever the explanation, the mother bird is really the head of the family; she is the most active in nest building, and in most cases in the care of the young; and among birds of prey, as among insects, the female is the larger and the more powerful.

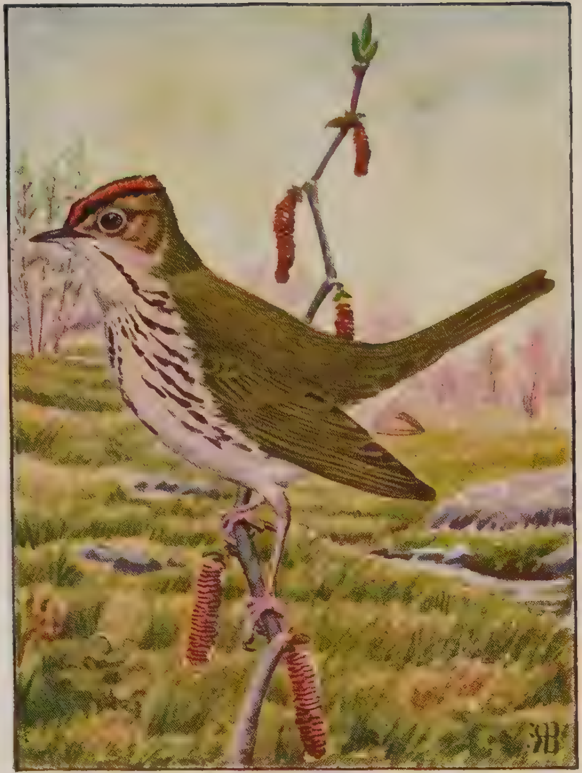
The wood thrush whose nest-building I have just described, laid only one egg, and an abnormal looking egg at that—very long and both ends of the same size. But to my surprise out of the abnormal looking egg came in due time a normal looking chick which grew to birdhood without any mishaps. The late, cold season and the consequent scarcity of food was undoubtedly the cause of so small a family.

Another pair of wood thrushes built a nest on the low branch of a maple by the roadside where I had it under daily observation. This nest presently held three eggs, two of which hatched in due time, and for a few days the young seemed to prosper. Then one morning I noticed the mother bird sitting in a silent, meditative way on the edge of the nest. As she made no move during the minute or two while I watched her, I drew near to see what was the matter. I found one of the young birds in a state of utter collapse; it was cold and all but lifeless. The next morning I found the bird again sitting motionless on the rim of the nest and gazing into it. I found one of the birds dead and the other nearly so. What had brought about the disaster I could not tell; no cause was apparent. I at first suspected vermin, but could detect none. The silent, baffled look of the mother bird I shall not soon forget. There was no demonstration of grief or alarm; only a brooding, puzzled look.

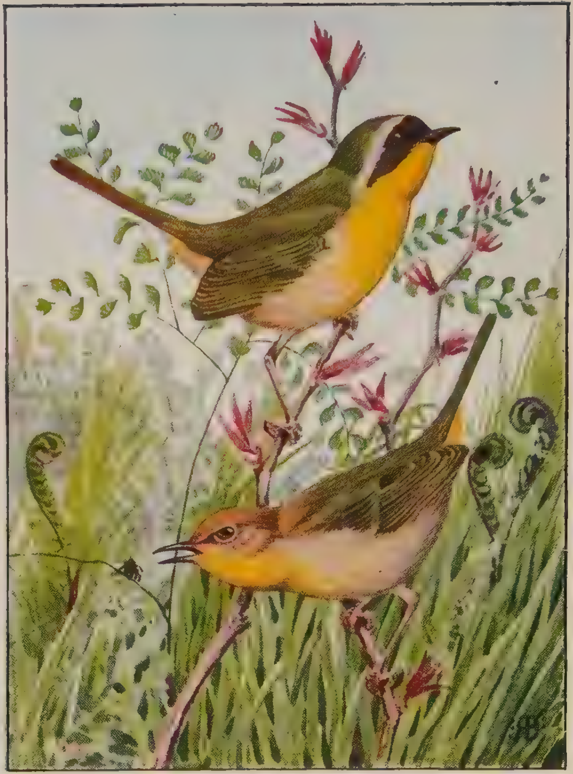
I once witnessed similar behavior on the part of a pair of bluebirds that were rearing a brood in a box on a grape post near my study. One day I chanced to observe one of the parent birds at the entrance of the nest gazing long and intently in. In the course of the day I saw this act several times, and in no case did the bird enter the box with food as it had been doing. Then I investigated and found the nearly fledged birds all dead. On removing them I found the nest infested with many dark, tough-skinned, very active worms or grubs nearly an inch long, that had apparently sucked the blood out of the bodies of the fledglings. These were probably the larvæ of some species of beetle unknown to me. The parent birds had looked on and seen their young destroyed and made no effort to free the nest of their enemy. Or probably they had not suspected what was going on, or did not understand it if they beheld it. Their instincts were not on the alert for an enemy so subtle, and one springing up in the nest itself. Any visible danger from without alarmed them instantly, but here was a new foe that doubtless they had never before had to cope with.

The oriole in her nest-building seems more fickle than most other birds. I have known orioles several times to begin a nest and then leave it and go elsewhere. Last year one started a nest in an oak near my study then after a few days of hesitating labor left it and selected the traditional site of her race, the pendent branch of an elm by the roadside. This time she behaved like a wise bird and came back for some of the material of the abandoned nest. She had attached a single piece of twine to the oak branch, and this she could not leave behind; twine was too useful and too hard to get. So I saw her tugging at this string till she loosened it, then flew toward the elm with it trailing in the air behind her. I could but smile at her thrift. The second nest she completed and occupied, and doubtless found her pendent-nest instinct fully satisfied by the high swaying elm branch.

One of our prettiest nest builders is the junco, or snowbird; in fact, it builds the prettiest nest to be found upon the ground, I think—more massive and finely molded and finished than that of the song sparrow. And it is more woodsy and has the rarer beauty of sylvan things. I find it only in the Catskills, or on their borders, often in a mossy bank by the roadside, in the woods, or on their threshold. With what delicate and consummate art it is insinuated into the wild scene, like some shy thing that grew there, visible, yet hidden by its perfect fitness and harmony with its surroundings. The mother bird darts out but a few yards

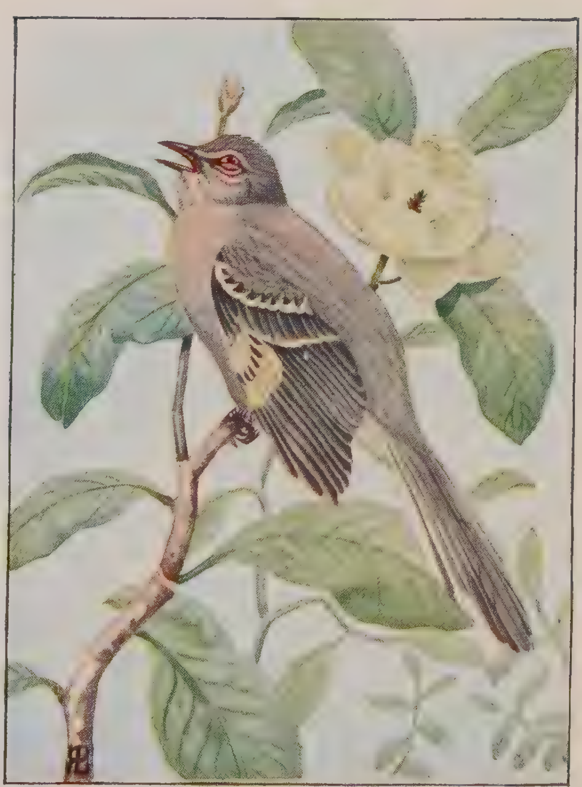


OVEN BIRD (1/2 nat. size)

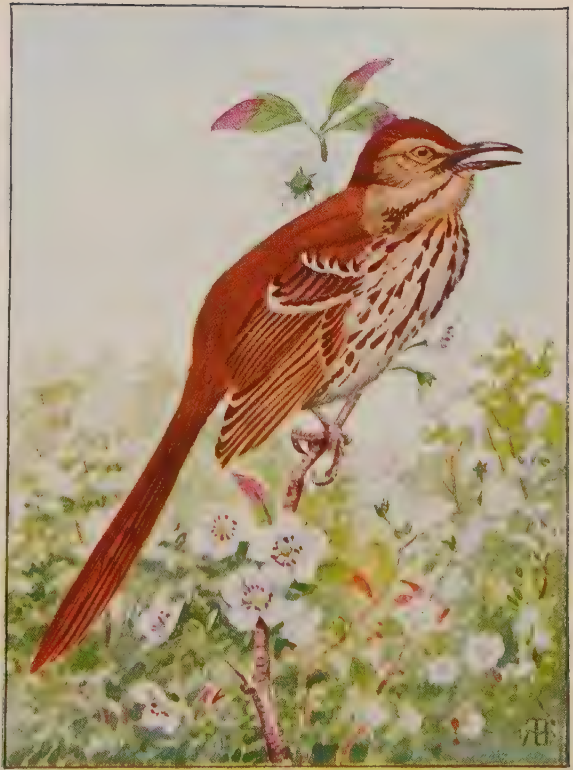


MARYLAND YELLOWTHROAT (1/2 nat. size)

FROM DRAWINGS BY R. I. BRASHER



MOCKINGBIRD (1/3 nat. size)



THRASHER (3/8 nat. size)

FROM DRAWINGS BY R. I. BRASHER

from you as you drive or walk along, but your eye is baffled for some moments before you have her secret. Such a keen-feather-edged, not to say spiteful little body, with the emphasis of those two white quills in her tail given to every movement, and yet, a less crabbed, less hasty nest, softer and more suggestive of shy sylvan ways, than is hers, would be hard to find.

One day I was walking along the grassy borders of a beech and maple wood with a friend when, as we came to a little low mound of moss and grass, scarcely a foot high, I said, "This is just the spot for a junco's nest," and as I stooped down to examine it, out flew the bird. I had divined better than I knew. What a pretty secret that little foot-stool of moss and grass-covered earth held! How exquisite the nest, how exquisite the place, how fit and sylvan the whole scene! How could these eggs long escape the prowling foxes, skunks, 'coons, the sharp-eyed crows, the searching mice and squirrels? They did not escape; in a day or two they were gone.

Another junco's nest beside a Catskill trout stream sticks in my memory. It was in an open grassy place amid the trees and bushes near the highway. There were ladies in our trouting party, and I called them to come and see the treasure I had found.

"Where is it?" one of them said, as she stopped and looked around a few paces from me.

"It is within six feet of you," I replied. She looked about incredulous, as it seemed an unlikely place for a nest of any sort, so open was it, and so easily swept by the first glance.

As she stepped along, perplexed, I said, "Now it is within one yard of you." She thought I was joking; but stooping down, determined not to be baffled, she espied it sheltered by a thin, mossy stone that stood up seven or eight inches above the turf and tilted about at the angle of one side of a house roof. Under this the nest was tucked, sheltered from the sun and rain, and hidden from all but the sharpest eye.

NATURE LOVER'S CREED

I believe in nature, and in God's out-of-doors.

I believe in pure air, fresh water and abundant sunlight.

I believe in the mountains, and as I lift up mine eyes to behold them, I receive help and strength.

I believe that below their snowy crowns their mantles should be ever green.

I believe in the forests where the sick may be healed and the weary strengthened; where the aged may renew their youth, and the young gather stores of wisdom which shall abide with them forever.

I believe that the groves were God's first temples, and that here all hearts should be glad, and no evil thoughts come to mar the peace; I believe that all who seek shelter within these aisles should guard the noble heritage from harm, and the fire fiend never be allowed to roam unwatched.

I believe in the highland springs and lakes, and would have noble trees stand guard around them; upon the mountain sides I would spread a thick carpet of leaves and moss through which the water might find its way into the valleys and onward to the ocean.

I believe in the giant trees which have stood for thousands of years, and pray that no harm shall come nigh to them.

I believe in the axe of the trained woodsman and would have it hew down the mature trees of today that we may secure lumber for our needs, and the trees of smaller growth have more light and air and space.

I believe in the seeds of the trees, and would gather and plant them, and I would care for the seedlings until they are ready to stand with their brothers in the forests and plains; then the wilderness and the dry land shall be glad and the desert shall rejoice.

I believe in protecting the birds and the animals that live amidst the trees, and the ferns and mosses and blossoming plants.

I believe in all the beautiful things of nature, and would preserve, protect and cherish them.

"Come let's to the fields, the meads, and the mountains,
The forests invite us, the streams and the fountains."

—Mrs. P. S. Peterson

MAMMALS EVERY ONE SHOULD KNOW

EDITED BY LEE S. CRANDALL

The longer I live the more my mind dwells upon the beauty and the wonder of the world.—JOHN BURROUGHS.

THE DEER FAMILY

(*Cervidæ*)

THE Deer Family stands next to the Cattle and Sheep Family (*Bovidæ*) in general usefulness. The flesh is a valuable food, while the antlers or horns, as well as the skins, are important articles of commerce. Venison was more common than beef on the tables of medieval Europe, and was the flesh most commonly eaten by early settlers and frontiersmen in North America.

Except in a few species like the Caribou, only the male Deer have antlers. Although these horns are deciduous, they are solid processes produced from the frontal bone, and have the physical as well as the chemical properties of true bone. They are of two general types—those more or less broad and flat, and those rounded in shape. Those of the flattened type are usually the more massive, but the rounded antlers of the Wapiti are exceptionally heavy.

Deerhorn has several uses. It produces much gelatin by decoction, the product being like that from most animal substances. The raspings and waste pieces of the horns used in manufacturing knife handles are either made into gelatin or boiled down into size used in cloth manufacture. At one time deerhorn was much used in making ammonia. The principal use of deerhorn is in the manufacturing of handles for knives, forks, and other instruments.

The use of deerskins is well known. As tanned and dressed by the American Indians they are manufactured into a variety of useful and ornamental articles. The inhabitants of some of the Indian villages of the North derive a good income from their manufacture of deerskins into moccasins, rackets, toboggans, and other things for sale. Deer hide makes an excellent leather, its value depending upon the size as well as upon the species from which it comes. The skins of Wapiti, for instance, are porous, and the leather does not wear well, while those of the Moose and European Elk are so thick and hard that the leather is said to have resisted musket balls. In Sweden in former times a pair of elk-hide breeches went as a legacy through several generations of peasants. Formerly about 200,000 deerskins from North America were sold annually in the London market. Half of these were skins of the Wapiti. Many were bought for Germany and there manufactured into leggings, but the heavier skins were tanned and manufactured in England. In recent years the export of deerskins from America has fallen off greatly.

Deer hair has a peculiar cellular structure, and is used in some parts of the world for stuffing saddles, for which purpose it is especially suited.

North America is comparatively rich in species of Deer. All of them are valuable food animals, and nearly all have been of great commercial and economic value during the development of the country. While their commercial importance has been greatly lessened as their numbers diminished, they still play an important part in furnishing food in newly settled parts of the United States and Canada, as well as in feeding the native tribes in the far North. Except in States that have extensive forested areas and have protected Deer for a series of years, they are rapidly disappearing before the encroachments of agriculture. The remnant are valuable chiefly because they are a natural resource which may be indefinitely developed if carefully husbanded.

David E. Lantz, U. S. Biological Survey.

WAPITI, OR AMERICAN ELK

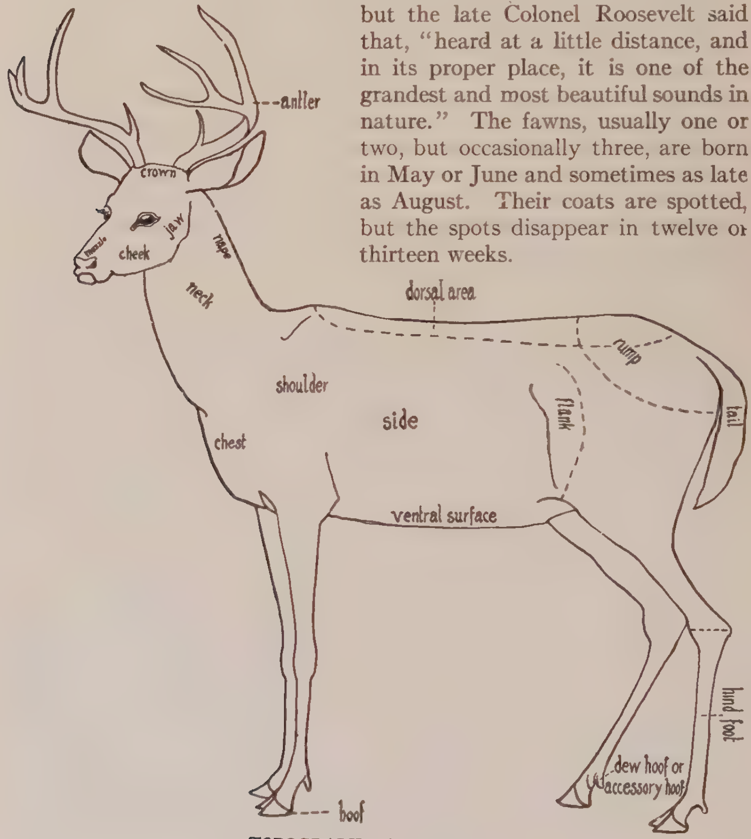
CERVUS CANADENSIS (*Erxleben*)

GENERAL DESCRIPTION.—A large member of the Deer family, the male with massive antlers shed annually, the female hornless and smaller. Weight of adult bull, 600 pounds or more. Color, yellowish-gray to tawny-brown. Tail short. A fine, well-proportioned animal standing about five feet at the shoulders. Gregarious in habit.

A NATIVE of North America, the history of the Wapiti is a repetition of that of the Bison—persistent and ruthless slaughter by man. In former times it was found over most of the North American continent, from Mexico to Vancouver, and from New Jersey across the Alleghenies to the Pacific coast. It lived, like the Buffalo, on the open plains. In 1849 in the great valley of San Joaquin, in California, bands of Wapiti numbering many thousands roamed like cattle. To-day it is confined chiefly to the northern region of the Rocky Mountains, but nowhere can it be said to be abundant except in the Yellowstone National Park, where perhaps there are some 30,000. Small herds and scattered individuals are occasionally met with in various States, and Wapiti from private parks and preserves have from time to time been liberated in various forests. It is gratifying to note that the number of States in which this lordly animal receives protection is increasing.

The King of the Cervidæ, for as such is the Wapiti looked upon, differs from his lesser kin, the Mule Deer, in that he is more inclined to living in herds and has many wives. Another point of difference is that he is not given to feeding at night, but at the first indication of day and in the late afternoon. During the day they lie down, usually on an open, sunny hillslope facing the south, or in the timber if much hunted. In winter when the snow is deep they are naturally more inclined to browsing, even standing on their hind legs to enable them to reach higher up in the trees. They are especially fond of aspen, birch, and the tops of the willows. In winter they gather in large bands and keep the snow well trodden down in the locality which they have selected.

The shedding of the antlers of the full-grown stag usually takes place late in December or during the month of January. The spike-horn bulls do not shed until much later, often as late as May or June. They are proud of their little sharp antlers, and do not hesitate to remind with a prod the old bulls who have shed, that they are still well armed. The new antlers begin to sprout in March or April, and during the summer while growing they are covered with skin and hair, and are soft and full of blood, with club-like knobs. In this condition they are spoken of as being "in the velvet." It is a great drain on their system while this remarkable growth is going on. The stags grow thin and the fear of hurting their young antlers, which are very tender, makes them quite timid and inoffensive. By the middle of August the antlers are completely grown, and the covering or velvet is then rubbed off against trees and bushes, and the ends of the tines polished. For many are the battles to be fought before gaining possession of a harem. The mating season varies in different localities, but usually begins in September. At this time the bulls become very pugnacious; their necks swell; and they challenge continually. The call, or "bugle," of the male Wapiti is described by Dr. Hornaday as "a shrill shriek, like an English locomotive whistle, sliding down the scale into a terrific bawl"; but the late Colonel Roosevelt said that, "heard at a little distance, and in its proper place, it is one of the grandest and most beautiful sounds in nature." The fawns, usually one or two, but occasionally three, are born in May or June and sometimes as late as August. Their coats are spotted, but the spots disappear in twelve or thirteen weeks.



TOPOGRAPHY OF A DEER

Except in late spring and summer, Wapiti are restless, roving animals. Their migrations vary in different places both in regard to distance and to time. In the old times, before they had been molested by man, herds were known to travel as far as 200 miles. The Wapiti in the Yellowstone National Park migrate south every winter to Jackson's Hole.

The Wapiti has been described as "the most omnivorous of the vegetarians." It both browses and grazes, eating grasses, leaves, and especially the buds and tender shoots of shrubs. It is fond of the water, and is equally at home among the high mountains, in the deep forests, and on treeless plains.

ROOSEVELT ELK

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

The economic value of the Wapiti as a food animal has not hitherto been sufficiently appreciated. It is easily domesticated, becoming in three or four generations "as gentle as sheep that run wild." It is less nervous and more easily confined than the ordinary deer. Given suitable State regulations for killing and marketing, elk vension could be raised more cheaply than beef, mutton, or pork. A cow Wapiti yields a considerably larger percentage of dressed meat than cattle.

VIRGINIA DEER

ODOCOILEUS AMERICANUS (*Erxleben*)

OTHER NAME.—White-tailed Deer.

GENERAL DESCRIPTION.—A fairly large Deer, the male with deciduous antlers, female lacking antlers. Tail long for a Deer, rather bushy and white on the under side.

Antlers moderately large and branching, directed forward, no brow tines. Color reddish brown.

The Virginia, or White-tailed Deer, commonly known among sportsmen as the "White-tail," is the most widely distributed game animal of the United States; it was the first kind of Deer killed for food by the early settlers on the Atlantic coast; and the prophecy has been made that "it will also be the last of the large, hoofed animals of North America to become extinct." Related species range from Canada and New England, as far south as Texas. Thanks to the protection afforded by State game laws, the Virginia Deer is probably more numerous in New England and in New York State than it was thirty years ago. Its prolonged existence in a wild state has been accounted for by some mainly by "the fact that it is an inveterate skulker, and fond of the thickest cover. Accordingly it usually has to be killed by stealth and stratagem."

YOUNG VIRGINIA DEER

A fairly large White-tail measures five feet in length, and three feet high at the shoulders, and weighs a little over 280 pounds. The antlers differ from those of most other Deer in pointing forward as they rise, a short distance from the forehead. They rarely exceed twenty-nine inches in length.

As might have been expected, the great differences in climate and habitat induce many changes of habits. For instance, in the North the mating season is October to November, and the fawns are born in May or June. In Louisiana the season begins in June to July, and the fawns are born in January or February. Each doe has usually but one fawn each year; it is fifteen and one-half inches high, and its weight is about four and one-half pounds. Again, in the Louisiana marshes the White-tail live in the same locality throughout the year; but in the Adirondacks the Deer change their habits with the seasons. "Soon after the fawns are born they come down to the water's edge, preferring the neighborhood of the lakes, but also haunting the stream banks. The next three months, during the hot weather, they keep very close to the water. Where they are much hunted, they only come to the water's edge after dark, but in regions where they are little disturbed they are quite as often diurnal in their habits. . . . Before September the Deer cease coming to the water and go back among the dense forests, and on the mountains. There is no genuine migration, as in the case of the Mule Deer, from one big tract to another, and no entire desertion of any locality."

With the exception of the Adirondacks, Maine has the greatest number of Virginia Deer today, and this notwithstanding the fact that several thousand are killed annually by hunters holding the permits of the State.

The White-tail is exceedingly graceful when in motion. One enthusiastic sportsman writes of it: "The White-tail moves with an indescribable spring and buoyancy. If surprised close up, and much terrified, it simply runs away as hard as it can, at a gait not materially different from that of any other game animal under like circumstances. . . . But normally its mode of progression, whether it trots or gallops, is entirely unique. In trotting, the head and tail are both held erect, and the animal throws out its legs with a singularly proud and free motion. . . . In the canter, or gallop, the head and tail are also held erect, the flashing white brush being very conspicuous. Three or four low, long, marvelously springy bounds are taken, and then a great leap is made high in the air, which is succeeded by three or four low bounds, and then by another high leap. A White-tail going through the brush in this manner is a singularly beautiful sight."

No animal does better in captivity than the Virginia Deer. It feeds on almost any kind of vegetable. Lichens, mosses, fallen leaves, lily pads acorns, beechnuts, chestnuts, and other mast, all go to make up its diet. Add to these a good supply of running water and access to rocksalt, and the White-tail menu is complete. Except the goat, no animal requires so little attention. It is a prolific breeder. One buck is assigned to twelve does. The does will usually begin their breeding at seventeen months.

There are several related species of this Deer, but the slight differences in size or marking can usually be traced to environment.

MULE DEER

ODOCOILEUS HEMIONUS (*Rafinesque*)

GENERAL DESCRIPTION.—A moderate-sized deer, with robust antlers and large ears. Tail covered with short hairs, naked on under side and with a black tuft at the end. Leg gland unusually large. Body color yellowish-brown to reddish-brown. High bounding gait. Antlers never developing as many tines as with the White-tailed Deer, but dividing on each beam into two characteristic Y's.

NEXT to the Wapiti and Moose, the Mule Deer is the largest of our American Cervidæ. Its limbs are larger and coarser than those of the White-tailed Deer, and it is less agile and elastic in its movements; also less graceful in form. The large ears very probably suggested the name of Mule Deer. The most striking difference between the White-tailed Deer and the Mule Deer is found in the antlers. With the Mule Deer the tines from the main beam divide to form two Y's on each beam, whereas in the White-tailed Deer, the tines from the main beam seldom divide.

MULE DEER

The Mule Deer was first discovered by Lewis and Clark on September 18, 1804, in latitude 42°, on the Missouri River. They then called it the Black-tailed Deer. On May 31, 1805, they discovered the true Black-tailed Deer, on the Columbia River.

The Mule Deer is considered one of the most imposing of the Cervidæ in appearance. It holds its head and neck erect, while its antlers are much wider than those of its white-tailed cousin. In winter its color is a sober gray, changing in summer to soft brown, thus enabling it to blend in with the landscape to a remarkable degree.

This animal is at home in the wildest, roughest, and most mountainous country. It frequents both the deep ravines and the mountain heights. "It is a proud-spirited, high-headed animal," says Dr. Hornaday, "a bold traveler, and, like the Mountain Sheep, is often found where the scenery is wild and picturesque. In this respect it differs from the White-tailed Deer, which prefers low ground, and either brush or timber in which to hide."

The Mule Deer has a peculiar running gait—a progression of stiff-legged leaps, in which the feet come down together to the ground, then bound off again like steel springs. But it can run at astonishing speed for long distances. In the chase it will tire out most dogs and wolves. In the Rocky Mountains, where the true Black-tailed Deer is not known, the Mule Deer is still referred to as the Black-tailed. On the Pacific coast, where it is found on the same range as the Columbia Black-tailed Deer, it is known by its true name.

The most natural home of the Mule Deer is in the mountains, but before the occupation of the country it frequented the Great Plains. West of the Rocky Mountains this species of Deer is still met with in many localities. In the coast range north of San Francisco it is almost entirely replaced by the Columbia Black-tailed Deer. In Oregon, Washington, and British Columbia the Mule Deer is not so numerous as in the Rockies further east.

This Deer may produce two fawns at each birth, but in past years its breeding has nowhere near kept pace with the rate of killing, and it is a pity that this breed seems doomed to extinction.

Columbia Black-tailed Deer

Odocoileus columbianus (*Richardson*)

General Description.—A large Deer with heavy antlers on the male. Tail longer than that of Mule Deer and much broader. Ear normal. Body and legs short. Body color yellowish-red.

This Deer, the most common on the Pacific slope, was discovered by Lewis and Clark in 1805, when in the region of the Columbia River, and is described in the list of fauna observed by them as the "Black-tailed Fallow Deer." It is remarkable for having the most limited range of all Deer of America, being found in British Columbia and on the Pacific coast only. In southern Oregon it has been seen a few miles over the crest of the Cascade range, as far east as Klamath Lake, and in most abundance about forty miles east of Cottage Grove.

The Columbia Black-tail is generally smaller than the two other types. Its ears are large, and its eyes are perhaps the most beautiful of all the Deer Family, being large, and a brilliant liquid black. The weight ranges from 175 to 225 pounds; an exceptionally large buck scaled over 270 pounds. The antlers, which are neither so large nor so handsome as those of the Mule Deer, vary considerably in size; a pair twenty-three inches long and having a spread of twenty-four inches would be considered good. They are divided sometimes once, sometimes twice, and are shed annually in the spring. Forthwith the bucks make their way to the higher mountains, remaining in the thick brush for five or six weeks, in which short time the new horns attain their full growth, but are, of course, still in the velvet. The Indians are said to be fond of the soft horn, and hunting dogs must be kept from it, as they regard it with evident liking.

In winter, the color of the animal is a beautiful steel-gray, the face being gray with dark forehead; the throat and under parts are white, and the legs dark cinnamon. The tail, which is the distinguishing feature of this species of Deer, is round, and dull black, except for about a quarter of its circumference on the under side, which is white. As the tail of the Mule Deer is also black, hunters not infrequently mistake that animal for the Columbia Black-tail; but there is this distinct difference between the two: the tail of the Mule Deer is naked underneath, while that of the Columbia Black-tail is entirely covered with hair.

Courtesy of New York Zoological Society

BLACK-TAILED DEER
FROM A PHOTOGRAPH BY E. R. SANBORN

The mating season is from late September to November, the actions of the bucks at this time being almost ludicrous. "With bulging eyes and widespread legs, they plunge through the forest as if possessed of an unclean spirit—hardly noticing even a hunter when they meet him, or, if they should do so, plainly showing that they would almost as soon fight as flee." The does are very prolific, producing, in the spring, two, and not uncommonly three fawns at a birth. The fawns are beautifully marked with almost white spots, which they retain for four or five months. So long as the does are nursing, the Deer lie very close, but the bucks do not appear to trouble themselves much about the welfare of their offspring.

While not strictly nocturnal, this Deer is a night rover, and loves a good moon. It then can get all the exercise it requires before daylight, and lies down during the day. It cares little for grass, but delights in the tender twigs and leaves of the huckleberry, salal, and in evergreen foliage generally. In the natural park at Vancouver it has been seen to feed on "the foliage of spruce, Douglas fir, and juniper in succession," and where little molested it has been known to go down to the shore to feed on a certain kind of seaweed.

An interesting fact has been noticed respecting this Deer in the region of the Cascade Mountains, in Oregon. A large number migrate every spring to the high mountains, returning thence before the snow begins to get deep; the others remain all summer in the coast range, and the condition of both bands is equally good. Like the Moose and Wapiti, the Columbia Black-tail "yards" in the winter, and the Indians, taking advantage of this fact, slaughter it in great numbers, especially in the region of the Bitter Root and Cœur d'Alene Mountains. The animal is now protected in all the States where found, and owing to the unfrequented nature of many of its haunts, it seems to be in no danger of extinction.

It should be mentioned that the Columbia Black-tail is a "bounding" Deer, that is, all of its four feet strike the ground together. This gait, which has earned for it in Manitoba the name of "Jumping Deer," has not changed in the last hundred years, Lewis and Clark having recorded that it "does not leap, but jumps like frightened sheep." It is a dangerous animal to approach when wounded.

MOOSE

ALCES AMERICANUS *Jardine*

GENERAL DESCRIPTION.—Largest of the American Deer. Antlers, on male only, excessively broad and heavy, palmate. Tail short. Muzzle inflated, broad and drooping. Muzzle haired, except extreme lower portion. A hanging growth of skin and long hair, the bell, on throat. Higher at shoulders than at rump. Long pointed hoofs, well developed side hoofs. Color black or dusky. Ears large.

THE Moose is the giant among Deer; the killing of one is the realization of the deer-hunter's highest ambition. Those who have seen the animal only in our natural history museums or zoölogical parks can hardly realize the imposing appearance of an adult male "full of strength and purpose, striding like a four-legged Colossus through the evergreen forests of Canada or Alaska, or swinging away at incredible speed from dangers of the chase." No other species of Deer roams through so wide an extent of forest country of the northern portion of the North American continent. From Alaska southward to Wyoming (in latitude 43°), and eastward through Canada, northern Minnesota, Maine, New Brunswick, and Nova Scotia, the Moose in one or other of its species is to be found. In British Columbia, Washington, and southern and southeastern Alaska they do not approach the coast, but in the Alaska and Kenai peninsulas their range is down to the sea.

The common Moose, which is now most numerous in New Brunswick, Maine and lower Canada, is not so large as his brother, the Alaska Moose of the Kenai Peninsula, so far as antlers are concerned. An average specimen of the adult Common Moose stands about five feet nine inches at the shoulders, and one over six feet would be a very fine animal. The weight of the male often exceeds 1,000 pounds. The females are smaller than the males. In both, the nostrils are large, and the muzzle hairy and long.

In color the Common Moose is lighter in Maine and lower Canada than it is farther west. The head, neck, and body are blackish-brown; the legs and under parts yellowish-gray, and in some cases almost white. The hair is very coarse, and is six inches long on the neck and shoulders. From the neck depends a pouch-like piece of hair-covered skin, called the "bell."

The Common Moose is an ungainly creature. Its front legs are considerably longer than the hind ones, rendering its gait extremely awkward; but their length, quite four feet, enables it to stride with facility over fallen trees in the forest which prove annoying obstacles to its pursuers. Its overhanging, square-ended nose, large ears, and a hump on the shoulders, all add to its ungainliness. Its ordinary gait is a long, springy trot, but it will walk long distances with great strides in a straight line across the marsh, splashing among the wet water plants, and plowing through boggy spaces with the indifference begotten of vast strength and legs longer than those of any other animal on this continent.

The Moose is a browsing animal, its legs being too long and its neck too short to allow it to graze; yet in the early spring, when greedy for the tender blades of young, green marsh grass, the Moose will often shuffle down on its knees to get at them, and it will occasionally perform the same feat to get a mouthful of snow in winter. In Maine and lower Canada it feeds extensively in the summer on pond lilies and other plants in the marshy lakes; sometimes when feeding in a pond or lake it will go completely under the water and out of sight after its favorite lily root. In the forests it feeds on moss and lichens and on the twigs, leaves, and bark of certain trees, such as willows, alders, and aspens. It is a powerful swimmer, and is especially fond of wading in shallow water.

The Moose usually has but one mate, and the mating season begins in September. The bulls at this time become absolutely reckless, and do battle royal for possession of the cow. The clashing of their antlers may sometimes be heard a mile off. The bulls seek the cows, uttering continually a short, loud roar, which can be heard at a distance of two or three miles; the cows now and then respond with low, plaintive bellows. Hunters and photographers of the Moose summon the animal to them by imitating the call of the bull on a horn made of birch bark. It has been a disputed question as to whether this call really deludes the Moose. The calves are born in May and usually remain with the cow till the second year. One or two at birth is the usual number; very occasionally there are triplets.

MOOSE SWIMMING

From a photograph by G. W. Viser

The Moose has several enemies, among them being the Bear, the Cougar (the most dangerous where both animals are at all plentiful), and the big Timber Wolf. Man, of course, is its most dreaded foe, though owing to the excellent game laws of many of the States, notably those of Maine, the Moose is now no longer in danger of extermination. It is hunted by several methods: calling (referred to above), still-hunting, fire-hunting from a canoe, and "crusting." The last two methods are considered unsportsmanlike. Crusting often degenerates into mere butchery, the animal breaking through the crust of snow and becoming helpless before its pursuers. Hunters who employ this method are often charged by Moose. They follow the animals on snowshoes during the late winter and early spring when the Moose have "yarded." A "yard," it should be explained, is a spot chosen by a Moose herd for their winter home because it contains plenty of browse and is sheltered from heavy snowdrifts. Across this space the Moose travel to and fro, making regular, beaten paths.

In forest preserves the Moose will thrive, but in zoölogical parks it seldom survives longer than five or six years, usually dying of some affection of the stomach and intestines, although fed on "the best tree branches that its own native forest can supply." It is docile in captivity and has been trained, like the Wapiti, to run in harness.

The Alaska Moose differs from the better known form by being larger and darker in color. This animal reaches proportions almost gigantic, and when at bay is a foe to be dreaded. Its home is the Kenai Peninsula of Alaska.

WOODLAND CARIBOU

RANGIFER CARIBOU (*Gmelin*)

OTHER NAME.—American Reindeer.

GENERAL DESCRIPTION.—A large Deer, the male weighing about 300 to 400 pounds. Antlers broad, found on both sexes, those of male wide and branching, of female much smaller, occasionally lacking entirely. Brow point present, flattened from side to side. Muzzle haired, wide, and heavily built. Ears and tail short. Mane on neck. Tarsal, but no leg gland. Hoofs broad and long, deeply cleft, with side hoofs reaching nearly to ground.

THIS Caribou, which is the original type of the Woodland Caribou group, is a large and powerful animal, about twice the size of a Virginia Deer. A typical specimen, from Maine, in the Zoölogical Park, New York, is described as "a strong lusty animal, forty-eight inches high at the shoulders, weighing 280 pounds, and endowed with sufficient energy to vanquish the strongest man in about one minute." The Woodland Caribou is an odd-looking creature. Its head, long and resembling some-

CARIBOU

FROM A GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY what that of the cow, is carried low and thrust forward; its shoulders are high and sharp. Its hoofs, which are cleft to the hocks, make, as it walks on the hard ground or withdraws them successively from the ooze of a marsh, a distinctly clicking sound.

When not suspecting danger, the Woodland Caribou has a careless, slouchy gait and, it must be confessed, an unattractive appearance; but when it scents a foe "the listless, careless pose gives place to one animated and full of spirited attention; the head is carried proudly aloft, crowned by its noble weapons of offense and defense. . . . And then, the foe appearing, how grand is the animal's movement as, in a stately trot, with head and tail uplifted, the proud Deer passes rapidly from view over the yielding moss."

The antlers present some noticeable differences from those of the Barren-Ground species, being generally "short in the main beam, liberally flattened both on brow-points and tips, and have upward of thirty points. As a whole, the antlers have a tree-top appearance."

One of the Woodland group, the so-called Osborn Caribou, is supposed to be the largest of Caribou; it has a height of fifty-five inches at the shoulders.

The summer coat of the Woodland Caribou is of a dark gray, with white under part and a white tail patch. In winter the body changes to a very light hue, and the neck becomes almost pure white. The color of the coat varies considerably in different members of the group. The Black-faced, or Mountain Caribou of southeastern British Columbia is, in September, nearly black, while the Barren-Ground is the whitest of all Caribou.

The female also usually has antlers, though smaller. Antlers are shed between the first of January and the end of February, the new ones growing slowly till the warm weather comes, when they lengthen rapidly, attaining full size about the first of September. The animal removes the velvet, or soft covering, by rubbing its antlers against the trees, and is then ready to do battle. The pairing season begins in September, and usually one fawn is born each year. Occasionally two are produced.

The Woodland Caribou, unlike his Barren-Ground brother, is a wide-awake animal. In districts where his chief enemy, man, has not molested him he is confiding. His "first inclination on seeing an intruder is to come up and play with him." Mr. Charles Sheldon in the Upper Yukon district saw a Caribou with her young one which came twenty-five yards toward him, looked at him indifferently and then trotted off. When surprised, the animals seem to become panic-stricken and unable to escape; but as soon as they scent danger they are off. On the ice they are exceedingly swift, soon outdistancing the hunter. The Woodland

Caribou is a forest rover, and is usually found in the swamps. The Cree Indians call it the Swamp Deer. They seek the mountains in the spring and spend their summer above the timber line, hiding in dense thickets in the day and coming out at night to wander about and to drink of the nearest lake. In the autumn the Caribou leaves the heights for the valleys, where it can more easily obtain food. It feeds on lichens, leaves, and berries, and is especially fond of cranberries. The animal is hunted by stalking, still-hunting, and on snowshoes, and of late years its numbers in many districts have become greatly reduced.

The flesh of this Caribou makes excellent venison and is much used by the northern Indians. In gait it resembles the Elk and Moose more than the smaller Deer. It travels with a long swinging trot, and goes much faster than it appears. The Caribou has good bottom, and can travel great distances, so that it is useless to try to follow when once they have become alarmed.

REINDEER

RANGIFER TARANDUS (*Linnæus*)

GENERAL DESCRIPTION.—See general description of Woodland Caribou. Size smaller than Woodland Caribou, with antlers longer, less broad and massive. Pasterns short and broad. White ring above hoofs poorly defined.

THIS Arctic Deer is of especial interest from the fact that it has long been domesticated and used as a draft animal and beast of burden. In its wild state it is much larger than the domesticated Reindeer. It is found in the sub-Arctic and Arctic regions of Europe and Asia, nearly as far north as the extreme limits of land.

Both male and female Reindeer have antlers. These are remarkable for their long, unequally branched antlers, and particularly for the fact that of the brow antlers, which are very broad, one is usually aborted and the other hangs over the face as in the Caribou. Another noteworthy feature of the Reindeer is its hoof. Just as the camel is enabled by its broad pad to traverse the trackless sands of the desert, so the Reindeer is equipped by nature for traveling over the vast snowfields of the North.

The Reindeer has a brownish coat, dark in summer and lighter in winter, with long, whitish hairs under the neck; the tail is short and goat-like, and the region about it, as also the outlines of the hoof, are nearly white. The hoofs themselves are black.

Of the breeding habits of the wild Reindeer little is known beyond the fact that the fawns are brought forth in the spring.

The Reindeer in its wild state wanders about the treeless mountains and desolate tundras, migrating in immense herds from one feeding-ground to another. Admiral von Wrangel, who witnessed one of these migrations, describes it as extending "further than the eye could reach, a compact mass narrowing to the front. They moved slowly and majestically along, their broad antlers resembling a moving wood of leafless trees. Each body was led by a Deer, a female, of unusual size."

Courtesy of New York Zoological Society

REINDEER

FROM A PHOTOGRAPH BY E. R. SANBORN

The Reindeer feeds largely on grasses, seaweed, and rock lichens. To obtain the last of these it will scrape away several feet of snow with its horns and feet.

Besides flesh and milk for food, the Reindeer furnishes skins for clothing and tents, and its horns and hoofs are also utilized commercially.

The remarkable strength; speed, and endurance of the Reindeer in drawing sledges over the snow are so well known that they need only be referred to here. Pictures of Santa Claus with his Reindeer sledge full of Christmas presents are among the recollections of our earliest childhood.

The interest of Americans in the Reindeer, however, centers in the experiment, made about a quarter of a century ago by the United States Government, of introducing Siberian and Lapland Reindeer into Alaska. This experiment has been so remarkably successful as to warrant more than casual mention here.

About the year 1887 the native tribes of northwestern Alaska, owing to their uneconomical habits of living, and the loss of food supplies, were in great danger of starvation. The suggestion was made to the United States Government that it would be a useful and humane undertaking for the Government to introduce Reindeer into the territory, and to train the natives in the care and use of them. In 1892 one hundred and seventy-two animals were imported. By 1902 there had been introduced, from Lapland and Siberia, 1,720 Reindeer, from which 6,116 fawns had been born. On June 30, 1913, the herds had increased to sixty-two, numbering no fewer than 47,266 animals, an increase of 20 per cent. over the previous year. During the year 5,000 had been killed for food and skins.

The distribution of the Reindeer to the natives of Alaska is made pro rata. Young natives are required to serve an apprenticeship of four years in the care and management of Reindeer, animals and food being supplied by the Government to such apprentices.

It is estimated that there are in Alaska areas of 400,000 square miles in the aggregate sufficient to feed 10,000,000 Reindeer.

Lapland Reindeer have recently been introduced into Labrador and northern Newfoundland, and the experiment promises to meet with great success.

THE ANTELOPE FAMILY

(*Antilocapridæ*)

ANTELOPES, while a family which has many important members in Africa, are represented in North America by only one member, the Pronghorn. This unique animal is more nearly akin to the *Bovidæ*, or oxen and sheep, than to its foreign brothers. It differs so widely from the foreign Antelope that scientists in despair have created for it a separate family which it occupies alone and undisturbed. The more important points of difference are: the horn is pronged, or branched, and is rooted very close to and above the eye; the horn, while a true one grown around a bony core, and not an antler, is shed and renewed every year; the pelage or hairy covering, consists of very coarse, brittle hairs, those on the rump being erectile like the bristles of a wild boar, and stiffen up at the first sign of danger; there are no accessory hoofs; and the marking is strikingly individual. The protective coloration, while generally good, is disturbed by a conspicuous white patch around the tail, which shows most plainly when the animal is in flight.

PRONGHORNED ANTELOPE

ANTILOCAPRA AMERICANA (*Ord*)

OTHER NAMES.—Pronghorn, Prongbuck, Antelope.

GENERAL DESCRIPTION.—Form deer-like. The male slightly larger than female, standing about 3 feet at shoulder. Both sexes horned, but female sometimes hornless, and horns of male invariably larger. Horns unique, being flattened, branched, elongate sheaths upon an unbranched bony core. Horns shed annually; core permanent and situated just above eye. But two hoofs on each foot, accessory hoofs wanting. Body color tan, with conspicuous white rump patch and two white bands across throat and chest. A thick mane of long hair on neck. Hair everywhere coarse and brittle. Ears long and pointed. Tail short, densely haired above. Numerous scent glands on jaw, rump, and legs. Horns and hoofs black.

THE Pronghorn is strictly a North American animal, and is the most graceful and the fleetest of all our quadrupeds. Until within the past few years it has been extensively slaughtered and, but for the timely legal protection afforded it by all the States within whose boundaries it is still found, it must in the course of a comparatively short period have suffered complete extermination. The Pronghorn first became known to scientists through a specimen brought back by Lewis and Clark from their expedition. Its range originally extended from the Mississippi River to the Pacific Ocean, northward into Canada, and southward into Mexico. At the present day only a few small, widely scattered herds exist, in California, Oregon, Utah, Idaho, Nevada, New Mexico, Texas, Kansas, Colorado, Wyoming, and Montana; from the extreme easterly and westerly limits of its former range it has disappeared entirely.

In its wild state, the Pronghorn normally prefers a barren, rolling country or naked plains, and avoids timber and broken ground; it has, however, been killed occasionally in places miles away from the nearest plains, and in recent years has been known to bring up its young in rough, hilly country. It avoids forests, and has no liking for high, bare mountains.

The Pronghorn is smaller than the northern Virginia Deer, but is more compactly built. The animal has a fuller muzzle than the Deer; its eye, nearly as large as that of the Elephant, is intensely black; and the expression, like that of the Gazelle, is soft and gentle. The ears, five inches long and three inches broad, and sharply pointed at the extremities, are covered with hair, both within and without. The earlier statement, that the female has no horns, is at variance with the observation of the animal by Dr. Caton, who says: "The horn of the female cannot be detected on the kid, on the yearling it can easily be felt; later I have found them half an inch long, . . . and it is only on the fully adult female that the horn appears above the hair. I have never met one more than one inch long, but others have found them three inches long." In an average-sized buck the horns are usually about twelve inches long (an exceptionally large pair measured seventeen inches), with width of twelve and one-half inches between the tips, and are situated directly over the eyes. At the tips they are curved backward a little, and they have a short forward branch or prong.

The coloration of the Pronghorn renders it a very conspicuous object in the landscape. It is a striking combination of russet, white and black (see details above). The tail is white with just a few tawny hairs on the top.

In several of its characteristics the Pronghorn differs materially from the Deer. It does not skulk or attempt to elude observation. Colonel Roosevelt, who hunted the animal for several years, says: "Its sole aim is to be able to see its enemies, and it cares nothing whatever about its enemies seeing it." When lying down for their noonday siesta, Pronghorns will even "choose a somewhat conspicuous station and trust to their own powers of observation, exactly as they do when feeding." Its powers of sight are much greater than those of the Deer, and it seems to divine intuitively the intentions of the hunter. On this point Mr. Arthur W. du Bray says he entirely agrees with the following statement of one of his old guides: "What a live Antelope don't see between dawn and dark isn't visible from his standpoint; and while you're a gawking at him thro' that 'ere glass to make out whether he's a rock or a goat, he's a countin' your cartridges and fixin's, and makin' up his mind which way he'll scoot when you disappear in the draw to sneak on 'im—and don't you forget it."

In a wild state, the curiosity of Pronghorns is so great that it often leads them to their destruction. In the old days of the prairie-schooner, the animals, attracted by the white canvas covering of that vehicle, would come so near that the teamsters shot them at will. James Capen Adams used to decoy them by merely holding up a handkerchief, his coat, or his hat; and he records that "to lie on one's back, with the feet in the air and the rifle between the legs, is a favorite and very successful mode of hunting them."

In spite of its fleetness and of its ability to make, without apparent effort, prodigious horizontal leaps, it seems unable to leap over an object a yard in height. Dr. Caton attributes this inability to the fact that, living on the plains, "they and their ancestors for untold generations have had no occasion to overleap high obstructions, and thus from disuse they do not know how to do so, and never attempt it when they do meet them."

The Pronghorn is a grazing animal, a vegetarian, and a delicate feeder. When wild, it lives largely on grasses, and is especially fond of the tender green blades that come up after an area has been burned over. It drinks once a day, and will travel long distances to some little watercourse. In captivity, it will eat apples sparingly, bread and cake if fresh and good, and the heads of timothy hay. It is fond of common salt.

The migratory habits of the Pronghorn vary with the locality. In some parts of its range it will travel in numbers for great distances each spring and autumn; in others the migrations are quite local; while in still other parts it does not migrate at all, remaining on the great plains throughout the year.

Pairing begins in September, and from then till the following March bucks, does, and fawns keep together in herds from which the does withdraw themselves one by one to give birth to their young. There are generally two fawns at a birth, and, when wild, they can run when only a few days old, thenceforward accompanying their mother everywhere.

The Pronghorn is readily tamed and soon learns to enjoy the society of man. A neighbor of Colonel Roosevelt had three fawns that had been fostered by a sheep, and which followed him about so closely that he had to be always on the lookout to see that he did not injure them; and Dr. Caton had one which assumed he had as much right in the kitchen as any of the domestics, and, if he found the doors open, he enjoyed a visit to the parlor, and especially a siesta on the lounge in the library.

THE OXEN, SHEEP, AND GOAT FAMILY

(*Bovidæ*)

ONE of the most important families of the entire animal kingdom is the *Bovidæ*. Its economic value to man, in both its wild and domesticated states, is incalculable. There are some fifty leading species, such as Bison, Buffalo, Mountain Sheep, Goats, Musk-ox, and Ibex, found in every continent except Australia and South America. On our own continent we have some of the finest specimens of the family, although their numbers have sadly dwindled before the relentless war of extermination which has been waged against them. The Bison, or Buffalo, is a striking example of this. A few decades ago it roamed the western plains in countless thousands. By the end of the century only heroic efforts on the part of the Governments of Canada and the United States and the establishment of a few private parks saved it from perishing.

The Hollow-horned Ruminants, or *Bovidæ*, are distinguished from their allies by the presence of true horns; that is to say, of hollow and unbranched sheaths of horn growing upon bony protuberances, or cores, arising from the frontal bones of the skull, neither horny sheaths nor the bony cores being shed at any period of existence. In all existing wild species these horns are present at least in the male sex; but in many domesticated races of cattle, sheep, and goats, they are absent in both sexes; and the same was true of certain extinct members of the family. Usually the molar teeth of the Hollow-horned Ruminants have very high crowns, and these animals have no tusks, or canine teeth, in the upper jaw. In some few instances the small toes at the side may be completely absent, but they are generally represented by small spurious hooflets. The Hollow-horned Ruminants are chiefly Old World forms, although they are represented in North America by the Musk-ox, the American Bison, the Rocky Mountain Goat, and the Bighorn Sheep. They are unknown in South America.

AMERICAN BISON, OR BUFFALO

BISON BISON (*Linnæus*)

GENERAL DESCRIPTION.—A large wild ox, horned in both sexes. The horns are curved and cylindrical, and grow annually, but are never shed. Two main hoofs, two accessory hoofs, on each foot. Stomach complex; chews cud. Spines of backbone at shoulders very high, producing great hump. Tail short, covered with short hair, but tuft of long hair on end. Hair long and woolly, especially on head and fore parts. Thick beard present. Color dark brown. Horns, hoofs, and muzzle black.

THE American Bison has long been popularly, though wrongly, known as the Buffalo, and the two terms will be used equally here. For the benefit of the non-naturalist it may be explained that a true Buffalo has no hump over its shoulders. Such an animal is the Water Buffalo of India, or the Carabao of the Philippine Islands. The American Buffalo has a considerable hump, and is a Bison. It is a large, massive animal, a fine adult bull measuring eleven feet from nose to root of tail, and five to six feet in height at the shoulders. Its average weight is about 1,800 pounds, but a large specimen has weighed as much as 2,190 pounds; the females are considerably smaller than the males. Its horns are sometimes twenty-two inches in length, with a girth of sixteen and three-eighths inches at the base, and a spread of thirty-five inches from tip to tip. In yearlings, the horns are four to six inches long. Until four years old, the young males are called "spike-bulls," and their horns are jet black. In the adult, they become grayish. The forequarters are very heavy, and covered with dense hair, and the tail has a terminal tassel.

The upper part of the body and the hind quarters are of a pale gray-brown; the lower parts, dark brown. The hump is covered with a dense mass of yellow-brown hair; the head, underpart of the neck, and the forelegs as far as the knees bear a covering of shaggy hair shading from dark brown above into black below. The body color of the cow is darker. The coat of the Bison is at its best in November and December.

By March it has become weatherbeaten and shabby, and shedding begins. For the next three months the old coat hangs in rags, and the animal presents a most dilapidated appearance.

Naturally among the millions of individual Buffaloes a few years ago, the hide, or "robe," as it was termed, exhibited many color varieties.

Thus there were black, blue, beaver, buckskin, and white or pied robes.

It seems pretty well established that the Bison has more than one mate, the observations of Audubon and Bachman to the contrary notwithstanding. The breeding season is from June to September. The cow does not breed till her third year. The combined bellowing, or "roaring" as it is called, of the bulls in the breeding time can be heard for miles. The calves (usually one, sometimes twins) are born about May or June. In their wild state, during the first few days of their life they were formerly subject to the depredations of the Coyote and Gray, or Buffalo, Wolf. Against one or two of these the cow could successfully defend her offspring, but if the assailants were numerous she would bellow to the bulls for assistance. These would quickly respond, and would stand in a circle around the calf, while the wolves "at some twelve or fifteen paces distant sat licking their chops in impatient expectancy." An incident of this nature was witnessed by an army surgeon, as related in "Plains of the Great West." The doctor determined to watch the performance. After a few moments the knot broke up, and, still keeping in a compact mass, started on a trot for the main herd, some half a mile off. To his very great astonishment, the doctor now saw that the central and controlling figure of this mass was a poor little calf, so newly born as scarcely to be able to walk. After going fifty to one hundred paces the calf lay down, the bulls disposed themselves in a circle as before, and the wolves who had trotted along on each side of their retreating supper sat down and licked their chops in vain.

The cow Bison is not always the most solicitous of mothers as regards her little one's safety. Mr. Ernest Thompson Seton states that a cowpuncher some years ago "often amused himself by roping the calves. When one was caught, he would jump off, remove the lasso, and hold it with his hands. The mother would stand at a distance of 100 yards gazing anxiously, neither cow nor calf making any sound. . . . As soon as he let the calf go, the mother, seeing it was free, knew it would take care of itself, and, turning tail, went off at full gallop, without even looking behind."

As the Bison shed their coats, leaving much of their hinder parts naked, they suffered much from the attacks of mosquitoes and from the prickly seeds of the spear grass. The huge animals availed themselves of any convenient bowlder or the trunks of trees against which to rub themselves, in their desire to gain relief from the insect scourges. The early telegraph poles over the plains were frequently thrown down by the Buffaloes rubbing against them. Another remedy employed was the wallow of water and mud.

Courtesy of New York Zoological Society

A HERD OF BISON
The Wichita Bull and Herd
FROM A PHOTOGRAPH BY E. R. SANBORN

During the latter part of the breeding season the animals of all ages and both sexes have intermixed in the herd. After September the males become indifferent to their partners, and separate themselves into one herd and the females into another. As early as 1542, Coronado and his followers were "much surprised at sometimes meeting innumerable herds of bulls without a single cow, and other herds of cows without bulls."

There has been some difference of opinion with regard to the Buffalo and migration. Catlin says: "These animals are, truly speaking, gregarious but not migratory"; and there are to be considered the undoubted facts that the line of march was not always the same, that in certain cases the movements of the herds were not prompted by the necessity of seeking fresh pasturage, and that herds were found winter and summer over certain parts of the animals' range. But, whether from choice or from necessity, vast numbers of Buffaloes, sometimes reaching into the millions, moved northward three or four hundred miles in the spring, and southward in the fall, and this habit is known to have existed for a hundred years. As Seton says: "Theoretically, the Buffalo must have been migratory. Although it covered a vast region, it continued of one species, whereas it would probably have split up into several distinct species had it not been continually mixed as the result of migrations."

Reference has already been made to the attacks of Gray Wolves on Buffalo calves. Weak and old Buffaloes also fell victims to these beasts of prey. Still the total number destroyed by them cannot have been very great. Far more terrible enemies were the prairie fires, quicksands, and treacherous ice on the rivers which, combined, were responsible for the death of enormous numbers of Buffaloes. In 1867, more than 2,000 out of a herd of some 4,000 were engulfed in a quicksand on the Platte River. Prairie fires destroyed whole herds.

Alexander Henry, in his "Journal," under date of November 25, 1804, records: "At sunset we arrived at the Indian camp, having made an extraordinary day's ride, and seen an incredible number of dead and dying, blind, lame, singed, and roasted Buffalo." Treacherous ice on the rivers took greater toll of Buffalo life than any other natural enemy of the animal. Under date of May 2, 1807, Henry records: "The number of Buffalo lying along the beach and on the banks passes all imagination. They form one continuous line and emit a horrible stench. I am informed that every spring it is about the same." John McDonnell, in his "Journal," states: "Observing a good many carcasses of Buffalo in the river and along the banks, I was taken up the whole day in counting them, and, to my surprise, found I had numbered when we put up at night, 7,360 drowned and mired along the river and in it." The yearly flood on the Missouri River "bore countless Buffalo hulks to be packed away in the Mississippi mud, that in some far geological day will be the rock, all stored with unnumbered bones." Rotten ice on all the northern rivers, totaling in length about 20,000 miles, must also have caused the death of enormous numbers of Buffaloes.

A further natural enemy of the Buffalo was, in the opinion of Mr. Seton, the blizzard. "The great herds that went north in 1870-1 never returned. There is no evidence that any large numbers of them were killed by hunters, red or white, and there is, therefore, but one reasonable explanation of their disappearance. They were exterminated by the blizzards of 1872. Further, I believe that, at times, the Dakota blizzard has taken heavier toll of the Buffalo than ever the Dakota Indian did."

No one who has not seen a wide plain covered by Buffalo can gain any idea of their countless numbers, only a very few years ago. Here are the impressions of one eye-witness, Col. R. I. Dodge, who in 1871 saw one of the immense herds while traveling in Arkansas. For twenty-five miles he passed through a continuous herd of Buffalo. "The whole country appeared one great mass of Buffalo, moving slowly to the northward; and it was only when actually among them that it could be ascertained that the apparently solid mass was composed of innumerable small herds of from fifty to two hundred animals, separated from the surrounding herds by greater or less space, but still separated. The herds in the valley sullenly got out of my way, and turning, stared stupidly at me, sometimes at only a few yards' distance. When I had reached a point where the hills were no longer more than a mile from the road, the Buffalo on the hills seeing an unusual object in their rear, turned, stared an instant, then started at full speed directly toward me, stampeding and bringing with them the numberless herds through which they passed, and pouring down on me all the herds, no longer separated, but one immense compact mass of plunging animals mad with fright, and as irresistible as an avalanche. Reining in my horse I waited until the front of the mass was within fifty yards, when a few well-directed shots split the herd, and sent it pouring off in two streams to the right and left. When all had passed they stopped, apparently perfectly satisfied, many within less than 100 yards. From the top of Pawnee Rock I could see from six to ten miles in almost every direction. This whole vast space was covered with Buffalo, looking at a distance like a compact mass."

The history of the Buffalo and its practical extermination as a wild animal reads like a tragedy. It has been so often recounted that only a few salient facts need be mentioned here. It is safe to put the primitive number of Buffalo at 50,000,000 to 60,000,000; in 1850, there were probably remaining 20,000,000; in 1870, only 5,500,000 were left; in 1888 (including some in captivity), a meagre 1,300; and about 1895 the remnant had probably dwindled to 800. To-day, thanks to the efforts of the governments of the United States and Canada, the New York Zoölogical Society, the American Bison Society, and certain public-spirited individuals, the Bison is breeding rapidly in parks and private preserves.

In 1920 it was estimated that there were in North America 6,469 full-blooded Bison; of this number 570 were wild (70 in the United States and 500 in Canada), and 5,896 were living in captivity (2,773 in the United States and 3,123 in Canada).

ROCKY MOUNTAIN SHEEP

OVIS CERVINA *Demarest*

OTHER NAME.—Bighorn.

GENERAL DESCRIPTION.—The Rocky Mountain Bighorn is a large wild sheep reaching a weight of about 350 pounds for the male. Body stout. Nose narrow, chin beardless. Ears small, pointed, hairy. Tail short, pointed. Side hoofs present, main hoofs large with spongy cushion. Glands between hoofs and below eyes. Head broadest between eyes. Both sexes horned, the horns of the male much the larger. Horns curving regularly backward, outward and downward, in a majestic spiral sweep. Transverse ridges on horns. Horns never shed. Hair of medium length, rather coarse and brittle. Color grayish-brown with patch of whitish on buttocks and above tail. Horns and hoofs blackish.

THE Bighorn might be called the Chamois of our western mountains, scaling the rugged cliffs and plunging over precipices with the same agility and confidence. The elastic spring of the animal when startled, and the easy poise of the splendid head, are exceedingly graceful, and the animal seems built and proportioned to the finest detail for the adventurous life it leads.

During the breeding season an old ram presides over the flock of ewes and lambs, driving the younger rams off by themselves, as is usual among the polygamous animals. The flocks are exceedingly watchful, and at the slightest alarm are off instantly, selecting a course that few animals or men care to follow. In early spring the Sheep venture farther down into the mountain valleys in search of food, but soon return to their rocky fastnesses among the higher slopes.

From the edges of the Alaskan glaciers to the dry waterless crags of the Mexican Sierras we find one species or other of the Mountain Sheep. In the "Bad Lands," the easternmost part of their range, Audubon made the acquaintance of these noble animals in 1843. He says: "The parts of the country usually chosen by the Sheep for their pastures are the most extraordinarily broken and precipitous clay hills or stony eminences that exist in the wild regions belonging to the Rocky Mountain chain. Perhaps some idea of the country they inhabit—which is called by

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TWO ROCKY MOUNTAIN SHEEP DISPUTING THE RIGHT OF WAY IN GLACIER NATIONAL PARK the French-Canadians and hunters 'mauvaise terres,' may be formed by imagining some hundred of loaves of sugar of different sizes, irregularly broken and truncated at top, placed somewhat apart, and magnifying them into hills of considerable size. Over these hills and ravines the Rocky Mountain Sheep bound up and down, and you may estimate the difficulty of approaching them and conceive the great activity and sure-footedness of this species. They form paths around these irregular clay cones that are at times six to eight hundred feet high, and in some situations are even fifteen hundred feet or more above the adjacent prairies; and along these they run at full speed, while to the eye of the spectator below, these tracks do not appear to be more than a few inches wide, although theyare generally from a foot to eighteen inches in breadth. In many places columns or piles of clay or hardened earth are to be seen eight or ten feet above the adjacent surface, covered or coped with a slaty, flat rock, thus resembling gigantic toadstools, and upon these singular places the Bighorns are frequently seen, gazing at the hunter who is winding about far below, looking like so many statues on their elevated pedestals. One cannot imagine how these animals reach these curious places, especially on these inaccessible points, beyond the reach of their greatest enemies, the Wolves, which prey upon them whenever they stray into the plains below."

Generally speaking, the range of the Bighorn extends from the northern States of old Mexico to northern British Columbia, and from the eastern base of the Rocky Mountains to the Pacific coast. There are many mountain ranges, however, within these limits, in which it has never been found. In Alaska it is replaced by the White Sheep (*Ovis dalli*), and in the Cassiar Mountains by the Black Sheep (*Ovis stonei*). This animal has few characteristics in common with the domestic Sheep. The horns of the wild ram resemble somewhat those of the domestic species, although more massive. The wild ewe has horns from six to eight inches long that curve backward, whereas the domestic ewe has none.

The lofty crags of the Rocky Mountain National Park are the natural home of the Bighorn. This animal is much larger than any domestic Sheep. It is powerful and wonderfully agile. When pursued these Sheep, even the lambs, unhesitatingly leap off precipitous cliffs. Of course, they strike friendly ledges every few feet to break the fall, but these ledges often are not wide enough to stand upon; they are mere rocky excrescences a foot or less in width, from which the Sheep plunge to the next and the next, and so on till they reach good footing in the valley below. So swift is the descent that, seen from below at a distance, these pauses are often scarcely apparent.

Persistent killing has largely reduced its numbers. An estimate, made only a few years ago, gave the following figures: Arizona, a few very widely scattered, small bands; Colorado (after twenty-five years' unbroken protection), 3,500; Utah, probably quite extinct; Wyoming, 100; Yellowstone National Park, 210 head, "safe and sound and slowly increasing"; Glacier Park, 700; Idaho, a remnant of, say 200; Montana, 100; Alberta and British Columbia, some fine herds and three preserves in which they are protected. In a large number of States the killing of Bighorn is now prohibited, but there is great difficulty in enforcing the game laws.

The Bighorn is a stoutly built animal, larger than the domestic Sheep, the ram standing about three and one-half feet high at the withers, and weighing about 300 pounds. A very fine ram, killed in Wyoming in 1889, measured fifty-eight inches from nose to root of tail, and had a height at the shoulders of forty inches. The tail was three inches long. The Bighorn has a heavy coat of coarse, stiff hair, resembling that of the Wapiti, and beneath this is a sparse covering of white wool. In summer, this is grayish-brown in color, often with a reddish tinge; in winter, it changes to bluish-gray in the upper parts; the under parts and portions of the legs are white; a dark stripe runs along the back to the tail, which is black and completely surrounded by a conspicuous creamy-white patch on the hind quarters.

The muscular development of the Rocky Mountain Bighorn is remarkable. As G. O. Shields says: "While possibly not as graceful and elastic in his movements as the Deer or the Antelope, yet he will leap from crag to crag, will bound up over ragged ledges, over ice-glazed slopes, or down perpendicular precipices, alighting on broken and disordered masses of rock with a courage and a sure-footedness that must challenge the admiration of everyone who has an opportunity to study him in his mountain home." At the same time many of the "hair-breadth stories and wonderful pictures of Sheep hunting, in which men climb and cling by their finger-tips to overhanging rock faces," must be considerably discounted.

The fact that the Sheep often plunge head first has given rise to the fable that they land on their curved horns. This is absolutely untrue; they always strike ledges with their feet held close together. There is no question, however, of the agility of the Bighorn in making its way over crags and rim-rocks; it is often found as high as 12,000 feet above sea-level; and it is equally true that it can dash down declivities whose steepness seems to threaten its certain destruction.

The lambs, one or two at a birth, are born in May or June, and early give evidence of their courage and agility, following the ewes wherever they lead. While the ewes and lambs are feeding, there is always one ewe that acts as sentinel to warn the flock of approaching danger. According to John Muir, "in spring and summer the full-grown rams form separate bands of from three to twenty and are usually found feeding along the edges of glacier meadows, or resting among castle-like crags of the high summits." In July and August all the Sheep may be looked for on the open tops. In September they feed a trifle lower down. In October they are to be seen most of the time at the tops again. In winter on the Fraser River they may be found on the flatbenches that rise from the river bed; and they have been known to come down even to the level of the ranches.

At the town of Ouray, in Colorado, the citizens put out alfalfa for the Rocky Mountain Sheep in the winter, and have done so for several years. When it is first put out, the Sheep "race down hill" for it. The Sheep "make their appearance after the first heavy snows in December, and stay around until spring, some of them lingering along into April." Although so wild in summer, they will, in winter, come right into the town for their forage.

The wild enemies of the Bighorn are the Puma and the Lynx, and not a few lambs are annually carried off by golden eagles. The flesh of the Bighorn is considered by many hunters to be the most delicious of the mountains.

ROCKY MOUNTAIN GOAT

OREAMNOS MONTANUS (*Ord*)

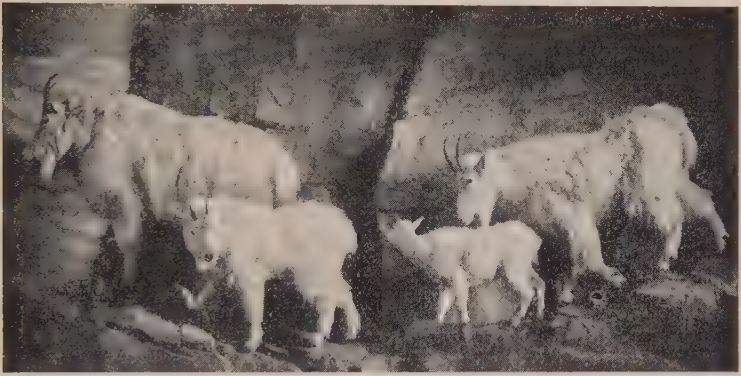
GENERAL DESCRIPTION.—Color white with black horns and hoofs. Height about three feet at withers. Weight 180-300 pounds. Both sexes have horns which are never shed. Horns ridged and roughened at base and curving gently backward and somewhat outward, those of male being the larger. Horns of young animals short and straighter. Tail short and almost hidden in long hair of rump. Muzzle is haired, there are no facial glands, and in both sexes a beard grows from sides of lower jaw. Ears moderate sized, clothed with short hairs. Shoulders are higher than rump, giving animal a humped appearance somewhat similar to that of the bison. A very shaggy animal.

HERE we have another case in which an animal has been popularly misnamed. Just as the Pronghorn has been miscalled the American Antelope, it not being a true Antelope, so our friend *Oreamnos montanus* is popularly known as the Rocky Mountain Goat, although it is not a Goat, but rather a goatlike Antelope. It is, in fact, most nearly related to the Alpine Chamois and the Himalayan Serow.

The so-called Goat of the Rocky Mountains is a sturdy animal set on short, stout legs, and weighing somewhat over 250 pounds. Its hoofs, upon which the bold climber has to depend so largely for its safety, are aptly described as consisting "of an ingenious combination of rubber-pad inside and knife-edge outside, to hold the owner equally well on snow, ice.

or bare rock." Its horns, present in both sexes, are about ten inches long, rough for about half their length, the remaining portion being smooth, and jet black; they curve backward. The animal stands about three feet high at the shoulders.

The fleece of the Rocky Mountain Goat is entirely yellowish-white, and, like the coat of the Musk-Ox, consists of a fine wool next the skin, through which grows an outer covering of long, straight hair. This hair being erect along the line of the back, and longer over the shoulders and hind quarters, gives a double-humped appearance to the animal. From the color of its fleece, it is sometimes called the White Goat.



ROCKY MOUNTAIN GOATS

From a habitat group in the American Museum of Natural History

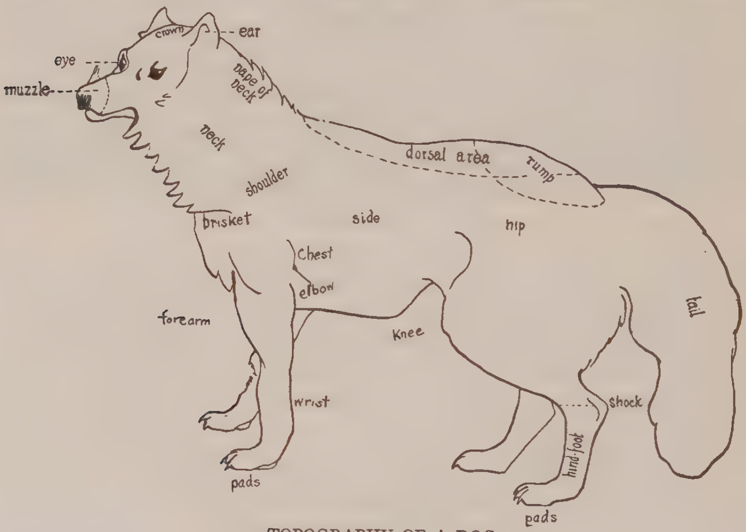
In spite of the comparative inaccessibility of its haunts, the range of the Mountain Goat is apparently lessening. At any rate, sportsmen and hunters find that it occurs in much smaller numbers than formerly, mainly in the States of Idaho, Montana, and Washington, and northward throughout British Columbia. Amidst the grandest, wildest scenery, above the timberline, crossing the faces of precipices that seem almost perpendicular, dwells *Oreamnos* in serene and contented isolation.

Up to 1903, only four Mountain Goats had been seen in captivity east of the Rocky Mountains. In 1905, Dr. Hornaday personally convoyed a herd of five goats from Fort Steele, British Columbia, to New York, and in May, 1908, the first Mountain Goat ever bred in captivity was born in the Zoölogical Park in that city. On June 8, 1910, a second kid was born. It was amusing to see these denizens of the mountains clambering over the roofs of their house. Their food consisted of "best clover hay, crushed oats, sliced carrots, and chopped apples."

THE DOG FAMILY

(*Canidæ*)

THIS family includes the Dogs, Wolves, and Foxes. Their claws are nonretractile, that is, they cannot draw them back, as the cats can, and they are not useful as weapons. All the members of the Dog family are digitigrade, or walk upon the front portion of their feet, just as we would if we raised our heels from the ground and walked on the soft front portion of the foot and the toes. They have five toes on the front feet, and four toes, with a rudimentary or imperfect toe above the others, on the hind feet.



TOPOGRAPHY OF A DOG

In their characters the wild members of the family are in no way like our faithful friend the dog. They are usually cunning, vicious, and treacherous, and exhibit no bravery except where there are numbers of their own kind. They are furtive and sneaking, looking for every unfair advantage, and, once in danger, are arrant cowards.

From the commerical side, however, the family is entitled to respect. The pelts both of Wolves and of Foxes are of value, those of certain varieties of Foxes bringing high prices.

Coyote

Canis latrans *Say*

Other Name.—Prairie Wolf.

General Description.—Like a shepherd dog in size and appearance. Nose sharp and slender; ears fully haired, erect, pointed. Pupil of eye circular. Tail of moderate length, bushy. Hair long and thick, color buffy-gray and black above, below whitish.

Measurements.—Sexes practically equal. Total length, 4 feet; length of tail, 16 inches; hind foot, 7 inches; ear, 4¼ inches. Weight, 30 to 40 pounds.

From southern Mexico to northern Alberta in Canada, and from Michigan to the Pacific coast, the Coyote, or Prairie Wolf, may be found pursuing its devious ways. It is much smaller than the Gray Wolf and far less savage; and its foxlike muzzle and ears seem to be an index to its craftiness and cunning. The typical Coyote gained its specific name *latrans* ("barking") from the fact that it habitually barks. Mr. Seton considers "the voice of the Coyote is one of its most remarkable gifts." He thinks that some of the animal's calls are "the outcome of the pleasure it finds in making a noise." Soon after the sun goes down the Coyote begins its "evening song." This is "a series of short barks, increasing in power and pitch till it changes into a long squall. One Coyote begins and

COYOTE

From a photograph by H. T. Bohlman and W. L. Finley immediately two or more join in, making so much noise that newcomers think there must be a hundred wolves out there."

An average male Coyote is about four feet in length, stands a little under two feet at the shoulders, and weighs a little over thirty pounds. The females are less.

Coyotes mate in February, and the cubs, usually five to seven, but occasionally as many as ten, are born in April. The den is either a hole excavated by the old Coyotes or, it may be, the abandoned hole of some other animal. The eyes of the "little strangers" open on the eighth or ninth day from birth. When they are about six weeks old solid food is brought home to them by the parents. The young leave the home nest in the fall.

The dietary of the Coyote has been described as "every kind of fish, flesh, and fowl that it can master, dead or alive." Turkeys and even sheep it will attack when pressed by hunger, and in some of the Southern States is it said to have developed a liking for watermelon. It will often slink after a hunter and pick up any offal it can. The Coyote shows great cunning in hunting its prey. When after jack-rabbits, a pair of Coyotes will work together; antelope and deer they often hunt in packs, spreading themselves into a wide circle and endeavoring to exhaust the quarry.

The Coyote does not attack man, but shows considerable ferocity with animals of its own size.

Though less cunning than the Gray Wolf, the Coyote, as has been stated above, is decidedly crafty. It is an adept in avoiding snares and traps, although hunger often induces it to partake of poisoned bait. It seems to know when a man is unarmed, and will sit undisturbed within gunshot; but when the hunter has his gun it is a different matter. Dr. Hornaday tried twice for two weeks, in Montana, to shoot a Coyote, and could not get within three hundred yards of one, and then only a running shot.

The Coyote has great speed. Mr. Seton places it at its best in the 2.30 class. When young, however, it falls a prey to the Gray Wolf, Eagle, and Horned Owl.

A small band of Coyotes hunting together has been known to kill Mountain Sheep which had been shut into a small pocket by an avalanche. Fawns are of course preyed upon in summer and early fall, but the adult Deer only in winter, when the crust will sustain the Coyote, but not the Deer. Forest rangers who have seen Coyotes pursuing Deer in this manner state that a band of five or six will overtake a Deer and hamstring it very quickly on a weak crust of snow. Many calves also are killed by Coyotes in the mountain parks, and in certain localities it is almost impossible to raise poultry because of them.

In some parts of the West, until recently, Coyotes were unusually abundant and destructive. Numbers were seen on the plains, where they mixed freely with the cattle, and evinced little fear of man unless he carried a gun. During the day one was in almost every extensive weed patch or growth of rank marsh grass, ready to pick up the turkeys and chickens which strayed too far from the ranch buildings. Coyotes have been seen catching Meadow Mice and playing with them like a cat.

The nocturnal prowlings, secretive disposition, and remarkable craftiness of the Coyote, together with the annoyance it has the power to inflict, cause it to figure prominently in the myths and religious history of the Indians of the far West. The Indians give this animal a curious position in their legends, some paying him high honor for his cunning, while others give him a low place because of his cowardliness. In some of these folk-lore tales he is called "Old Man Coyote," and varied are his adventures.

"In parts of the West where fruit growing and farming are dominant industries," says Dr. A. K. Fisher, "it may be wise to encourage Coyotes and Bobcats within certain limits, provided poultry and sheep are properly protected at night. Numerous ranchmen and fruit-growers have learned by experience that these animals, if unmolested, will free their premises from rabbits and other crop- or tree-destroyers. Where Coyotes have been allowed to do their work thoroughly, they are fully appreciated, and many ranchers would almost as soon shoot their own dogs and cats as their wild benefactors."

RED FOX

VULPES FULVA (*Desmarest*)

GENERAL DESCRIPTION.—Size of a small dog, total length about 3 feet. Fur long and soft. Tail long and bushy. Ears long, erect, pointed. Pupil of eye elliptical. Nose elongate and tapering. Color bright yellowish-rufous above, white underneath; feet, blackish. Claws long, sharp, non-retractile. Toes, 5 in front, 4 behind.

MEASUREMENTS.—Male about 1/10 larger than female. Length, male, 3 feet; tail 14½ inches; hind foot, 5¾ inches.

FROM time immemorial the English Red Fox has been accepted as the embodiment of speed, cunning, and resource; but Dr. M. G. Ellzey, who has hunted the American Red Fox in Virginia, is persuaded "that as found in the States of Maryland, Virginia, West Virginia, North Carolina, and Tennessee, the American Red Fox is an animal far superior to the English Fox in speed, endurance, cunning, and resource, when in front of a dangerous pack. He laughs an inferior pack to scorn." In the matter of daring, there is no doubt that he excels his British cousin.

The common Red Fox is to be found throughout the northeastern United States and Canada, as far south as the Carolinas. Though fond of the open prairies, it is especially partial to districts in which there are low hills and ravines, or where there is close proximity to cover. What may be termed its home range, however, is about five miles in diameter in summer, and probably twice that distance in winter.

RED FOX

From a habitat group in the American Museum of Natural History

The Red Fox takes its name from the rusty or yellowish-red color of its coat. The male is a little over three feet in length, the tail being about fourteen inches long. Its height is about thirteen inches. The female is smaller. In northern Foxes the tail is very large. Its hearing is remarkably keen, and it depends upon this more than upon its eyesight.

The Red Fox mates in February or early in March, and it seems to be fairly well established that the animal truly pairs. The male Fox is an attentive husband and brings food to his mate, whom he assists in caring for and feeding the cubs. The young are born about the first of April; there are four to nine cubs in a litter; and they are born in the den or "earth," which is sometimes excavated by the parents and sometimes is an adaptation of a hole that they have found. Besides the den proper, there is often a space used as a storeroom. The cubs, which are kitten-like in appearance, do not see till the eighth or ninth day from birth, and they remain in the den till they are three or four weeks old. Though nearly full-grown in August or September, the cubs are still to be found with their parents; they scatter, however, before winter.

The speed of the Red Fox is much greater than that of its gray cousin; it has been known to cover a certain distance at the rate of thirty miles an hour. Dr. Ellzey considers it more than a match for the hounds. The Fox seems to have no regular hours for sleeping or eating; it likes to sleep in the sunshine, and, when tired, "lies down for a nap, not usually in a hollow, but on some exposed place, the top of a bank, a bowlder, or stump. . . . He looks like a yellow stone, and seems to know it."

The Red Fox's dietary is both extensive and varied. For flesh, he partakes of woodchuck, hares, rabbits, and mice, with an occasional young lamb for a change. He has a pronounced fondness for the occupants of henroosts, also partridge, and other ground game. Fish and crabs form other items. Such delicate morsels as frogs and beetles he does not scorn when other food is scarce. He kills large numbers of mice and other destructive rodents, and thus recompenses the farmer to a great extent for the loss of an occasional chicken.

The enemies of the Red Fox are many, Wolves and Lynxes being among the four-footed ones. Eagles keep a sharp lookout for its young. Fleas are among its pests. It is sometimes subject to rabies. Its extreme age has been estimated at fifteen years.

The Cross Fox, the Black Fox, and the Silver Fox are simply color phases of the Red Fox. The furs of all of these are important articles of commerce, that of the Silver Fox being the most valuable.

Gray Fox

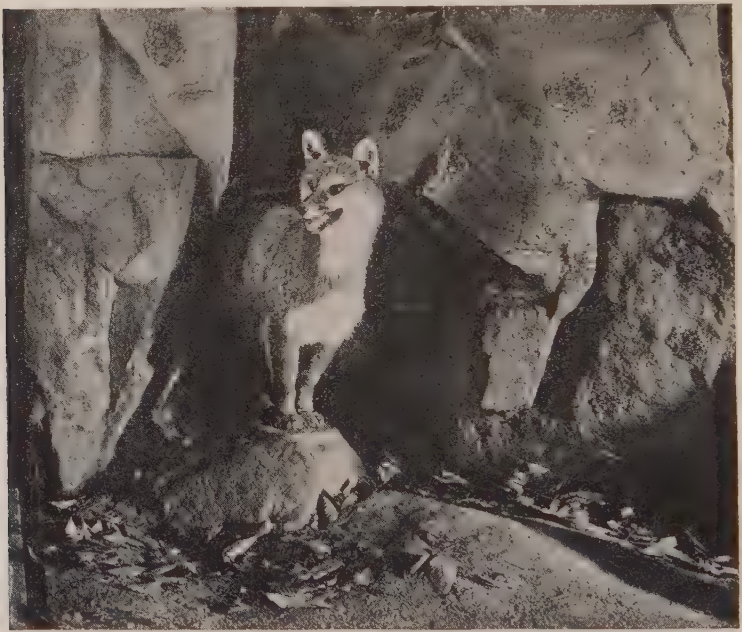
Urocyon cinereoargenteus (*Schreber*)

General Description.—The eastern Gray Fox is of medium size with moderately long hair and long bushy tail. Pupils of eyes elliptical; tail with concealed mane of stiff black hairs on its upper surface; skull with widely separated temporal crests; muzzle short. Color above silver-gray, beneath white. Hair coarser than that of Red Fox.

MEASUREMENTS.—Sexes nearly equal. Length 35 inches; tail, 11½ inches; hind foot, 5¼ inches. Weight, 8 pounds.

THE Gray Fox differs from its red cousin in color and size. It is not to be confused with the Silver-Gray Fox, which is an animal of widely differing traits. Of the common Gray Fox there are at least fourteen sub-species.

The Gray Fox is common to almost every State of the Union, although in some sections persistent hunting or the growth of towns has made it scarce. The Eastern Gray Fox ranges naturally from New England to the Mississippi Valley. In Florida, there is a smaller cousin. In Wisconsin, a larger one, marked with more yellow. In California, there are several species. It will thus be seen how much at home Gray Jacket has made himself.



GRAY FOX

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

Dr. Ellzey, when contrasting the habits of the Gray Fox with the Red, observes that the two animals differ very widely. "So far as my personal observations inform me," he says, "the following are some of the principal distinctions: First, as to reproduction, the Red Fox nearly always brings forth its young in an earth den, the Gray Fox generally in a hollow log or tree or, at most, under a rock. I have seldom seen a Gray with more than five, and often with only four young. I have never seen a Red with less than five. I have seen one with nine, and several with seven. I think it certain, therefore, that the Reds are more prolific. Second, as to hunting for prey and subsistence. The Reds are bolder in pursuit, and hunt over a much greater territory than the Grays. Whether the Grays ever climb trees in pursuit of prey I am uncertain, but they take to a tree as readily as a cat when run hard by hounds. I think it nearly certain that they climb for persimmons and grapes. Red Foxes never climb trees under any circumstances; when hard run they go to the earth. Gray Foxes run before hounds only a short distance, doubling constantly and for a short time, when they either 'hole' in a tree, or climb one. I have known the Red Fox to run straight away nearly twenty miles. Very commonly they run eight or ten miles away, and then run back in a parallel course. I have known them to run the four sides of a quadrilateral nine or ten miles long by about two miles broad. It is doubtful whether a first-rate specimen of the Red Fox, taken at his best in point of condition, can either be killed or run to earth by any pack of hounds living, such are his matchless speed and endurance. It is but a sorry pack which fails to kill or tree a Gray Fox in an hour's run. The young of the Gray Fox closely resemble small blackish puppies; those of the Red Fox are distinctly wolf-like in appearance when only a few hours old."

THE BEAR FAMILY

(*Ursidæ*)

BEARS comprise one of the most distinctly marked families of all the Carnivorous animals. No one familiar with animals could see a Bear even at a distance and fail to recognize it. While the Bears may differ widely in size and coloring in various countries, the same general traits are peculiar to all. In some species they grow to immense size, some of the largest being found in North America. They are, indeed, the largest of our Carnivores.

The skull of the Bear is heavy, and very long, the back portion being especially heavy, and the jaws are powerfully hinged. The teeth are true molars with broad flat crowns. All the members of the Bear Family are heavily and massively built. They have thick legs, very short tails, and have five toes, armed with powerful claws on both the fore and hind feet. Bears are plantigrade animals, which means that they walk on the soles of their feet with the heels touching the ground, just as man does. The soles of their feet are naked, and at a first hasty glance, the print of a bear's foot is not unlike a man's. The claws of the feet cannot be drawn back or retracted, and although no members of the family are in the habit of making burrows for themselves as the foxes do, the claws are well made for digging.

The various members of the family have a strong resemblance to one another, so that the characters by which the different species are distinguished are slight. Their fur is coarse, and generally long, thick, and shaggy, although it may be short and thin in some of the tropical species. Except for an occasional white collar round the throat, the fur is nearly always of one color, and generally some shade of either brown or black. It is true, indeed, that the Polar Bear is a marked exception to this rule, but in this case the color of the fur has evidently been specially modified to suit the natural surroundings. The great prevalence of black among the Bears is a feature unknown in any other group of Carnivores, and is indeed rare among the mammals in general.

Bears are widely distributed throughout Europe, Asia, and North America, while one species inhabits the South American Andes, and another the African Atlas. South, however, of the Atlas Mountains not a single member of the family is to be found throughout the length and breadth of Africa.

GRIZZLY BEAR

URSUS HORRIBILIS *Ord*

OTHER NAME.—Silver-tip Bear.

GENERAL DESCRIPTION.—Among the largest of the Bears, powerfully built, heavy, thick-set. Five well-developed toes on each foot; plantigrade; claws long, nearly straight, non-retractile; claws on front foot longer than those on hind foot; tail very short; ears short, rounded; color everywhere dark; generally of a deep brown color grizzled or frosted with white tipping to the hairs.

MEASUREMENTS.—Length, male, 8 to 9 feet; height at shoulder, 3½ to 4 feet; hind foot, 10 inches; claws, 4 to 6 inches. Weight, 600 to 800 pounds. Female, slightly smaller, weighing 500 pounds.

THE Grizzly Bear occupies a unique position in the history of the fauna of the North American Continent. From the times when the Indians (never in less than parties of six or eight) attacked it with bows and arrows, down to the present era of the breechloader and magazine rifle, it has stood, in public estimation, as the embodiment of all that is ferocious and terrible among big game animals.

Courtesy of New York Zoological Society

GRIZZLY BEAR
FROM A PHOTOGRAPH BY E. R. SANBORN

The Grizzly has certainly been more misrepresented than any other member of the Bear family. He has been discredited with the practice of hugging his victim to death; he has been accused of feasting upon mules; and one *quasi* authority states: "He will climb a fruit-tree, strip whole branches of ripe fruit with his huge paws and claw, and then on the way home will finish off the meal with a toad or a lizard." Mr. William H. Wright cites a State Senator who "tells of shooting a Grizzly four times through the heart and having it still chase him over down timber and bad going," and of another "that used to come once a week, climb a live-oak-tree, walk out along a horizontal branch over a high-fenced pig-pen, drop in, steal a little pig, push the gate open (it opened out), and go home." Dr. Hornaday, who has made many observations on the temper of the Grizzly, is "convinced that naturally the disposition of this reputedly savage creature is rather peaceful and good-natured. At the same time, however, no animal is more prompt to resent an affront or injury, or punish an offender. The Grizzly temper is defensive, not aggressive; and, unless the animal is cornered, or *thinks he is cornered*, he always flees from man.

Less than a quarter of a century ago, the range of the Grizzly Bear was given by naturalists as from Norton Sound, Alaska, through the Rocky Mountains to Mexico, and from the Pacific Coast across the Sierra Nevada to Wyoming; but this is now considerably diminished, and as long ago as 1903 it was stated that "in all parts of the United States save the Yellowstone Park and the Clearwater Mountains of Idaho, the Grizzly is now a rare animal, and so difficult to find that it is almost useless to seek it this side of British Columbia . . . in a short time none will exist in the United States outside of the Yellowstone Park and the zoölogical gardens. In the wilds of Alaska, they may survive for perhaps a quarter of a century longer."

Compared with the Black Bear, the Grizzly has a greater length of body, and is straighter along the back. The muzzle is rather square, the jaws are longer, and the forehead narrower. Another characteristic of the Grizzly is the great length of the third incisor on each side of the upper jaw. It has very powerful shoulders, and over these in some members of the group is a hump-like lift which hunters term the "roach." Its claws are from four to six inches long and very formidable; and while they do not enable the animal to climb a tree, they are admirably adapted for digging roots, turning over rocks or logs, and especially for fighting. A Grizzly has been known to carry off the carcass of an Elk weighing nearly 1,000 pounds.

The published accounts of the size and weight of the Grizzly Bear are, in many cases, very misleading and much exaggerated. Mr. Wright, who has hunted, studied, or photographed the animal for twenty-five years, has seen old Grizzlies, with "their teeth worn down to the gums," that would not have tipped the scales at more than 250 or 300 pounds. Dr. Rainsford estimated the largest of eighteen Grizzlies killed by him at not more than 850 pounds. Mr. Wright saw one in Spokane that had been "sold to a butcher, who claimed that he weighed it and paid for 1,173 pounds of bear meat."

With regard to color, Grizzlies show considerable variety. As long ago as 1805, Lewis and Clark in their journals described them as "grizzly," "gray," "white," "brown," and "variegated." Dr. Rainsford considers that all varieties of color are accounted for by the established fact of interbreeding; he himself "shot three young Bears going with one sow, one almost yellow, one almost black, and another nearly gray." Dr. Hornaday does not "know of any other Bear species in which the coloration of the pelage is so erratic." The standard color (in winter) is brown next to the skin, the extremities of the hair being tipped with silvery-gray, from which has come the common name of "Silver-tip."

It is difficult to describe the gait of a Grizzly. His walk is a shuffle, but he will go a very long way without breaking it; his run is a mixture of a lope and a gallop; and "no man can catch him in speed, and it takes a mighty good horse to catch him."

The feeding habits of the Grizzly Bear depend on his environment. In a good Elk country he will feed on the carcass of that animal; in the Clearwater region he forsakes this diet, and subsists on grass, salmon—he is a skillful fisherman—and ants, grubs, or larvæ. When the berries come round, he feeds on them; later, on salmon again, and once more on ants.

Grizzly Bears mate in the Northwest about the middle of June to August, and begin to hibernate in November, but these times vary somewhat in different regions. The cubs (generally two or three, but sometimes four) are born in the winter den of the female; and are tiny things for such huge parents. Two born in the Zoölogical Park, New York, weighed eight ounces each, and measured nine inches from nose to tail. The dam and cubs leave their den from one to three weeks after the male has left his winter quarters. A curious and unexplained habit of some Grizzlies at this time is that of scoring trees with their teeth; sometimes they will bite out considerable pieces from the trunks.

Of the nature and disposition of the Grizzly Bear something has been said above. In estimating the conflicting accounts that have been printed, it is obvious that the experience and opinions of those who have hunted the animal and studied it at close range are most to be relied upon. Dr. Rainsford considers that the increase in the power of the rifle, and "the pressure of civilization felt more and more in the wildest parts of the land," have brought about a change in the habits of the Grizzly, and that "the danger of his attack, in the present day, has been grossly exaggerated." He accounts for many of the stories of "charging" Grizzlies by the fact that "when fired at, whether wounded or not, he will almost invariably turn downhill and try to get away, and in doing so, often nearly tumbles over his antagonist, who fancies the Bear is charging at him, when his sole intention is to get away as soon as possible." Mr. Wright has "never known of a single instance where one of these Bears turned out of his way, unprovoked, to attack a human being."

In captivity, the Grizzly Bear responds to fair treatment better than any other well-armed animal does; it generally reaches full maturity between the ages of six and seven years. That the Grizzly can be tamed, if taken young, has been abundantly proved. James Capen Adams ("Grizzly Adams") had two which he had reared from cubhood, "Lady Washington," who used to carry his blankets, and sleep near him, and "Ben Franklin," who saved his master's life when attacked by a wild Grizzly.

AMERICAN BLACK BEAR

URSUS AMERICANUS *Pallas*

GENERAL DESCRIPTION.—A medium-sized animal weighing 200 to 400 pounds and black in color. Form robust; legs short, powerful; claws long, sharp, somewhat curved; tail short; soles naked; plantigrade. Molar teeth are broad, flat crowned and lack high sharp cusps. Hair long and moderately soft. Ears erect, rounded.

MEASUREMENTS.—Sexes almost equal. Length, 6 feet 5 inches; height at shoulder, 3 feet; tail, 5 inches; hind foot, 8 inches. Weight, 200 to 400 pounds.

THIS Bear has been described, by one who has studied it in the open for nearly thirty years, as "the most amusing, the most ludicrous, the most human and understandable of our wild animals." In its native state, it exists in larger numbers and is more widely distributed than any other species of bear; and in captivity it is one of the most "popular" of quadrupeds. It is the performing Bear *par excellence*, the Bear that can climb a tree; and its cleverness in learning tricks, its general tractability, and its playful disposition have combined to make it an invariable as well as an invaluable feature of most menageries.

Paradoxical as it may seem to say so, not all Black Bears are black. The ten or twelve members of the group show remarkable varieties of coloration, including glossy black, yellow-brown, olive-yellow, and mouse color; in the region of Flat Head Lake, in Montana, a number of albinos were seen. This variation in color has often given rise to the mistaken idea that the black and brown individuals of the group are different species. They are not.

Black Bears mate during the latter part of April. They are not particular about their winter home. The hibernating den may be any place that offers a fair promise of privacy and protection. A favorite device of the Black Bear is "to dig a hole under the butt end of a fallen tree, rake a few leaves into the opening, and then crawl in himself." Mr. William H. Wright, the well-known writer on bears, had a tame Bear which made a winter home for himself under the carriage-house, foraging for rags with which he covered the floor several inches thick, and "once he came back dragging a fine cashmere shawl that he had pulled off a clothesline where a neighbor had hung it to air."

BLACK BEAR (CINNAMON PHASE)
FROM A PHOTOGRAPH BY J. M. JOHNSON

The beginning of the hibernating period varies with the weather and the locality. In the northwest it is from November to January; but the

Black Bear will often come out for a time, if a warm spell occurs. It is a mistake to suppose that hibernating Bears are in a kind of comatose state, like the Woodchuck. They sleep, it is true; but they are easily aroused, and more than one hunter who has fallen through a crust of snow and landed on top of a hibernating Bear has found the animal to be very much awake. In captivity, hibernating Bears neither eat nor drink.

Black Bear cubs, numbering one to four—litters of the latter size are by no means uncommon—are born in the winter den of the mother between January and March, and from six weeks to two months before the mother comes out. They are almost naked, toothless, and their eyes do not open for some time. Single cubs vary in weight from eight to eighteen ounces. Usually, though not always, the Black Bear mother leaves her cubs to shift for themselves at the close of their first summer.

One characteristic of the Black Bear in feeding is that it does not cache its food. The Grizzly will store fish and hide a carcass; the Black Bear never does. The latter will learn to steal sheep, and is said to be a born pig thief.

As mentioned above, the Black Bear is preëminently a tree-climbing bear. Mr. Wright says: "He can climb as soon as he can walk, and his mother takes clever advantage of the fact. She sends her cubs up a tree whenever she wants them off her hands for a time—uses trees, indeed, very much as human mothers, who have no one to watch their children while they work, use day nurseries. The first thing a Black Bear mother does when any danger threatens is to send her cubs up a tree. . . . In all my experience I have never known cubs, when thus ordered into retirement by their mother, to come down from the selected tree until she called them. . . . Later in life the Black Bear comes to regard trees as its natural refuge from all dangers. . . . They can climb, and that with almost equal ease, any tree that will hold their weight; from a sapling, so small that there is just room for them to sink one set of hind claws above the other in a straight line, to an old giant so big that they can only cling to its face."

In the wild state, Black Bears will play together, and they "have a funny trick of pretending not to see each other when they meet." They are not given to systematic labor in seeking their food; will "work hard at any kind of mischief, but seem to hate to work steadily for business purposes." Probably no animal is so quick to evade the hunter. A recent writer asserts that on a highway in New Hampshire a Black Bear kept ahead of his automobile for a short distance when going at the rate of nearly thirty miles an hour.

The fur of the Black Bear is a valuable article of commerce. In the early part of the nineteenth century, in a single year 25,000 skins were imported into England, where they were used chiefly for military accoutrements.

The early backwoodsmen found the Black Bear a troublesome neighbor. It liked Indian corn, and was not averse to a young pig. "Like the Deer," says Audubon, "it changes its haunts with the seasons, and for the same reason, viz., the desire of obtaining food. During the spring months it searches for food in the low alluvial lands that border the rivers. or the margins of the inland lakes. There it procures abundance of succulent roots, and of the tender, juicy stems of plants, upon which it chiefly feeds at that season. During the summer heat it enters the gloomy swamps, and passes much of its time in wallowing in the mud like a hog; it seizes a young pig, or perhaps a sow or calf. As soon as the different kinds of berries ripen, the Bear betakes itself to the high ground; next visits the maize fields, which it ravages for a while. After this the various kinds of nuts and grapes, acorns and other forest fruits, attract its attention. The Black Bear is then seen wandering through the woods to gather this harvest, not forgetting to rob every tree which it comes across."

According to Dr. Merriam, the food of the Black Bear "consists not only of mice and other small mammals, turtles, frogs, and fish, but also, largely of ants and their eggs, bees and their honey, cherries, blackberries, raspberries, blueberries and various other fruits, vegetables, and roots. He sometimes makes devastating raids upon the barn yards, slaying and devouring sheep, calves, pigs and poultry." Another writer, Mr. C. C. Ward, states, as the result of his own experience, that the Black Bear "is growing more carnivorous and discontented with a diet of herbs. Assuredly, he is growing bolder. He is also developing a propensity to destroy more than he can eat, and it is not improbable that his posterity may cease to be frugi-carnivorous. It is fortunate that an animal of the strength and ferocity which he displays when aroused seldom attacks man. The formation of his powerful jaws and terrible canine teeth are well adapted to seize and hold his prey, and his molars are strong enough to crush the bones of an ox. His great strength, however, lies in his fore-arms and paws. His mode of attacking his prey is not to seize it with his teeth, but to strike terrific blows with his fore-paws. His weakness is for pork, and to obtain it he will run any risk. When the farmers, after suffering severe losses at his hands, become unusually alert, he retires to the depths of the forest and solaces himself with a young Moose, Caribou, or Deer. He seldom or never attacks a full grown Moose, but traces of desperate encounters, in which the Cow-Moose has battled for her offspring, are frequently met with in the woods."

THE RACCOON FAMILY

(*Procyonidæ*)

THE Raccoon Family in North America is limited to two members—the Raccoon, of which there are several species, and the Ring-tailed Cat. These animals are Carnivores, with head broad at the back and tapering rapidly forward to a narrow muzzle The ears are of moderate size. Feet are plantigrade, with soles naked. The toes are free, and capable of being widely spread. The claws are curved, and non-retractile. The tail is semi-bushy, and generally ringed. The body is short and stocky.

One member of this family is among the best known of our native animals; while the other is almost entirely unknown even to many sportsmen. This is because of the latter's restricted range in the desert lands along the Mexican border.

EASTERN RACCOON

PROCYON LOTOR (*Linnæus*)

GENERAL DESCRIPTION.—A short-legged, long-haired animal the size of a small dog (Cocker Spaniel). Head broad; nose pointed; tail bushy, cylindrical, and ringed; ears erect and comparatively short; toes, five on all feet; soles of feet naked; plantigrade; general color grayish or yellowish-gray, black patch about eye, and blackish rings around tail.

MEASUREMENTS.—Considerable variation. Average length, 32 inches; tail, 10½ inches; hind foot, 4½ inches. Weight, 15 to 22 pounds.

THE Raccoon is found only in North and Central America, from Alaska in the north to Costa Rica in the south. It is common to the whole of the United States. Raccoons are generally found in the woodlands near civilization, but avoid the dense evergreen forests of the interior. Like the numerous bats and the flying squirrels, they are one of the most nocturnal of North American mammals yet they may occasionally be seen abroad on cloudy days. In diet they are preferably flesh-eaters, feeding upon poultry, mice, young birds, birds' eggs, fresh-water tortoises and their eggs, frogs, fish, mollusks, and insects. Occasionally, however, they vary this with a diet of nuts, fruits, and corn. They delight to sport in the shallow water on the margins of pools and streams, where they capture the smaller fish lurking beneath the stones, and the fresh-water mussels buried in the mud and sand. They also catch such fish as happen into pools near the shore, although they are unable to dive in pursuit of their prey. They are, however, good swimmers. Although first-rate climbers, and making their nests in a hollow high up in some large tree, Raccoons cannot be considered arboreal animals. They neither hunt their prey among the tree-tops, nor feed upon the young shoots and twigs. Trees, however, form their nesting and breeding places, and likewise their refuge when pursued by human or other foes. With the falling shades of night they invariably descend to hunt their prey and search for food.

EASTERN RACCOON

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

This animal is known colloquially all over the United States as the "Coon." Its fur was highly prized by the early settlers, and Coon-skin caps were a staple article of apparel. In weight it is about equal to a common Fox, but it is short and stout. Restless, inquisitive, and prying, it is a most mischievous beast where farm-yards and poultry are within reach. It kills the fowls, eats the eggs, samples the fruit, and if caught, generally puts up a stiff fight, although it is said that it sometimes shams death with all the skill of an Opossum. It is very fond of fish and shellfish, and opens bivalves with wonderful skill.

The Raccoon has been one of the most valuable of the fur-bearing animals of North America, and is consequently much persecuted. Raccoon skins were formerly used as a recognized circulating medium in the States of the Mississippi valley.

The Raccoon may be easily caught in steel traps; but it is essential that these should be set under water near the margins of swamps or streams. The more sporting method in the South is to hunt these animals at night with specially trained dogs, which are usually a breed of Foxhounds. It has often been stated that the Raccoon leaves a very faint foot-scent; but this opinion is controverted by some hunters, who state that hounds will hunt a Raccoon at midday over snow, on a trail which has been made the previous night. The Raccoon after a short run invariably takes to a tree, and stays there until it is captured or escapes. It will stick tightly even while the tree is being felled to bring it to earth.

Like the Bear, the Raccoon is plantigrade in its manner of walking. It has been nicknamed "the little brother of the Bear," from this and other similarities. For example, it is fond of dipping its food into water before eating it. Raccoons are easily domesticated and prove amusing pets. Accounts of tame Coons are to be picked up almost anywhere, and although exhibiting plenty of originality in most ways, they all seem to agree on this one particular, that when meat is offered them it must be thoroughly washed, many a Coon preferring to go hungry rather than eat flesh which it has not been allowed to wash. They are not willing to let any one else do the work for them.

Raccoons are most at home in a hollow tree. Here they construct a rough nest and rear five or six young every year. "The Raccoon hibernates during the severest part of the winter," says Dr. Merriam, "retiring to his nest rather early, and appearing again in February or March, according to the earliness or lateness of the season. Disliking to wade through deep snow he does not come out much till the alternate thawing and freezing of the surface, suggestive of coming spring, makes a hard crust upon which he can run with ease. He does not usually walk many miles during a single night, and consequently is soon tracked to the tree, in some hole of which he has retired for the day. It is unusual to find a Raccoon alone, for they commonly live and travel in small companies, consisting of several members of a single family."

THE WEASEL FAMILY

(*Mustelidæ*)

A NUMEROUS group of fur-bearers comprise the Weasel Family, which is scattered all over the world, with the exception of Australia and Madagascar. They include Weasels, Badgers, Skunks, Minks, Otters, Martens, and Wolverenes. They are small in size, some being quite diminutive, but as a rule are fierce and bloodthirsty. Their bodies are long and slender, their motions are quick and graceful, their strength and endurance prodigious. They have short, powerful legs with feet adapted to running, climbing, digging, burrowing, or swimming. Most members of the family take readily to the water. They have five-toed feet, which are both plantigrade and digitigrade. In other words, they sometimes walk on the soles of the feet, and sometimes run on the toes. Some of the members of the family possess glands, from which they can throw an evil-smelling fluid, this being one of their weapons of defense.

The members of this family differ widely in coloration. In some of the northern forms a single animal will change its dress from dark in summer to light in winter. Others, such as Skunk, will have broad stripes of white contrasting with black or brown. Others, like the Otter, have fur of a uniformly dark tint; while a nearly related member will possess a coat of wonderful brilliance.

The wide range of colors coupled with the softness of the fur has made the members of this family of great economic importance. They are highly prized among furriers, some of the species bringing high prices.

American Wolverene

Gulo luscus *Linnæus*

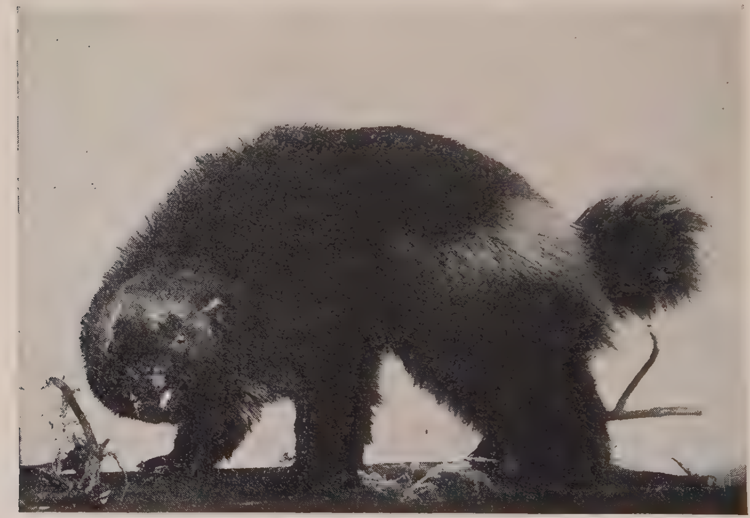
Other Names.—Glutton, Carcajou.

General Description.—A robust animal built like a small Bear and weighing 20 to 25 pounds. Tail bushy, short; soles hairy, ears short; claws strong, curved, partially retractile; fur moderately long; color blackish-brown with lighter areas on face and along sides. Sexes alike. A very powerful animal for its size.

Measurements.—Length, male, 36 to 38 inches; tail, 7 inches; hind foot, 7 inches; ear, 2 inches. Weight, 25 pounds.

The Wolverene, also known as the Glutton and Carcajou, has been the subject of more legends and quaint stories than almost any other animal.

Courtesy of American Museum of Natural History



AMERICAN WOLVERENE

According to the Indians, it is inhabited by an evil spirit. The French-Canadian also gave it strange characteristics, under the name of Carcajou. In fact, the myths clustering about this animal date back as early as the sixteenth century in Europe. Olaus Magnus (1562), to whom is commonly attributed the earliest mention, gives a most extraordinary account, made up of the then current popular traditions and superstitions, and tales of hunters or travelers, unchecked by any proper scientific inquiry; although, to do him justice, he does not entirely credit them himself. We may be sure that such savory morsels of animal biography did not escape the notice of subsequent compilers, and that they lost nothing of their flavor at the hands of Buffon. Probably no youth's early conceptions of the Glutton were uncolored with romance; the general picture impressed upon the susceptible mind of that period being that of a ravenous monster of insatiate voracity, matchless strength, and supernatural cunning, a terror to all other beasts, the bloodthirsty master of the forest.

These stories are highly absurd, says Coues, who describes the Wolverene as "simply an uncommonly large, clumsy, shaggy Marten or Weasel, of great strength, without corresponding agility, highly carnivorous, like the rest of its tribe, and displaying great perseverance and sagacity in procuring food in its northern residence when the supply is limited or precarious, often making long uninterrupted journeys, although so short-legged. It is imperfectly plantigrade, and does not climb trees like most of its allies. It lives in dens or burrows, and does not hibernate. It feeds upon the carcasses of large animals which it finds already slain, but does not destroy such creatures itself, its ordinary prey being of a much humbler character. It is a notorious thief, not only of stores of meat and fish laid up by the natives of the countries it inhabits, the baits of their traps, and the animals so caught, but also of articles of no possible service to itself; and avoids with most admirable cunning the various methods devised for its destruction in retaliation."

The fur of the Wolverene is highly valued both by civilized and uncivilized people. A number of skins sewed together make a very beautiful carriage robe or hearth-rug, and the pelts are in common use for these purposes. The Indians and Eskimos use the fur as they do that of the Wolf, for fringing their garments, the skin being in strips for this purpose.

The Wolverene ranges in greater or less abundance all over the northern portions of this country. It appears to be particularly numerous in the Mackenzie River region, and it fairly infests the whole country bordering the lower portions of this river and the west side of the mountains. Many accounts from various officers of the Hudson's Bay Company bear witness to the wonderful cunning and sagacity of the beast, as well as its ferocity, and represent it to be the greatest enemy with which the hunters and trappers have to contend in the pursuit of fur-bearing animals.

To the trapper, Wolverenes are especially annoying. When they have discovered a line of marten traps they will never abandon the road, and must be killed before the trapping can be successfully carried on. Beginning at one end, they proceed from trap to trap along the whole line, pulling them successively to pieces, and taking out the baits from behind. When they can eat no more, they continue to steal the baits and cache them. If hungry, they may devour two or three of the martens they find captured, the remainder being carried off and hidden in the snow at a considerable distance. The work of demolition goes on as fast as the traps can be renewed.

The propensity to steal and hide things is one of the strongest traits of the Wolverene. Besides the wanton destruction of traps, it will carry off the sticks and hide them at a distance, apparently in sheer malice.

Fatal tragedies have occurred in pioneer camps, on account of such thefts—the man who suffered the loss of his goods often suspecting one of his human neighbors.

Though very clumsy, the Wolverene manages to capture, at times, such prey as hares or grouse, and successfully attacks disabled deer. It also feeds on offal or carrion; in fact, anything that it can catch or steal. Its own flesh is only eatable in the extreme of starvation. Wolverenes bring forth in burrows under ground, probably old bear washes, and have four or five young at a birth. It is very rarely that they are discovered at this period or while suckling their young. One reason, however, may be that they reproduce late in June and early in July, when the mosquitoes are so numerous that no one who can avoid it goes abroad in the woods. The mating season is in the latter part of March. The female is ferocious in the defense of her young, and if disturbed at this time will not hesitate to attack a man. Indeed, Indians have been heard to aver that they would sooner encounter a she-Bear with her cubs than a Carcajou under the same circumstances. In October, when the rivers set fast, the Wolverenes reappear in families, the young still following their dam, though now not much her inferior in size. They are full grown when about a year old. In early infancy, the cubs are said to be a pale cream color.

The Wolverene is almost exclusively nocturnal, there being but few instances of its having been seen abroad during the day; and it has been seen to sit up and shade its eyes with its paws, as if suffering from the unaccustomed light. It ascends rough-barked trees with facility, although it is said that its climbing powers are exerted only when it scents food. In the pursuit of prey the Wolverene will readily swim rivers. As a rule, it is silent, although when attacked it will give vent to angry growls.

These animals are found both solitary and in pairs, but generally solitary. During the day they live concealed in subterranean holes, which are usually their breeding-places, and which are frequently the deserted lairs of Bears.

AMERICAN MARTEN

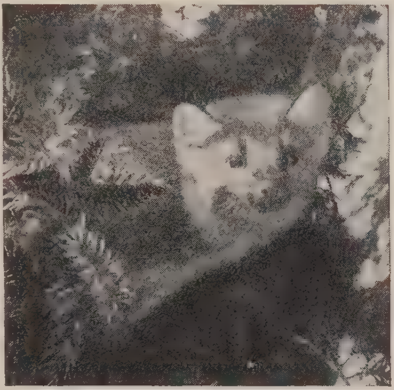
MARTES (=MUSTELA) AMERICANA (*Turton*)

OTHER NAMES.—Pine Marten, American Sable.

GENERAL DESCRIPTION.—A long, slender-bodied animal, rather smaller than a house cat. Limbs short; tail moderate, inclined to be bushy; soles furred, pads naked; claws compressed, acute, semi-retractile; ears large; head roughly triangular with sharp nose; color above orange-brown, belly brownish, spot on breast orange. Habits arboreal.

MEASUREMENTS.—Length, 25 inches; tail, 8 inches; hind foot, 3¾ inches.

THE Martens in America have been given many names, due at first to the effort to distinguish them from their foreign kin. Although the American animal was known in very early times, long before it received a distinctive name, having been referred alternately to the European Pine Marten and Asiatic Sable, or to both of these species, very little definite information upon its range and habits was recorded for many years. As an article of commerce in comparatively early times, we notice the sale of some 15,000 skins in one year (1743) by the Hudson's Bay Company, and the importation from Canada by the French into Rochelle of over 30,000. "Once in two or three years the animals come out in great multitudes, as if their retreats were overstocked; this the hunters look on as a forerunner of great snows, and a season favorable to the chase." Such periodicity in numbers thus early noted is confirmed by later observations.



MARTEN

FROM A PHOTOGRAPH BY O. J. MURIE

The Sable is principally trapped during the colder months, from October to April, when the fur is in good condition; it is nearly valueless during the shedding in summer. Sometimes, however, bait is refused in March, and even earlier, probably with the coming on of the pairing season. The period of full furring varies both in spring and autumn, according to latitude, by about a month as an extreme.

Although the Sable is persistently hunted, it does not appear to diminish materially in numbers in unsettled parts of the country. It holds its own partly in consequence of its shyness, which keeps it away from the abodes of men, and partly because it is so prolific; it brings forth six to eight young in a litter. Its home is sometimes a den underground or beneath rocks, but oftener the hollow of a tree; it frequently takes forcible possession of a Squirrel's nest, driving off or devouring the rightful proprietor. Though frequently called Pine Marten, like its European relative, it does not appear to be particularly attached to coniferous woods, living in them simply because such forests prevail to a great extent in the geographical areas it inhabits.

"The Sable," says Coues, "is no partner in guilt with the Mink and Stoat in invasion of the farm-yard, nor will it, indeed, designedly take up its abode in the clearing of a settler, preferring always to take its chances of food supply in the recesses of the forest. Active, industrious, cunning and predacious withal, it finds ample subsistence in the weaker rodents, insectivora, and birds and their eggs. It hunts on the ground for mice, which constitute a large share of its sustenance, as well as for shrews, moles, certain reptiles, and insects. An expert climber, quite at home in the leafy intricacies of tree tops, it pursues squirrels, and goes bird's-nesting with success. It is said also to secure toads, frogs, lizards, and even fish.

"The Sable has some of the musky odor characteristic of its family, but in very mild degree compared with the Mink or Polecat. With a general presence more pleasing, it combines a nature, if not less truly predacious, at least less sanguinary and insatiable. It does not kill after its hunger is appeased, nor does a blind ferocity lead it to attack animals as much larger than itself as those that the Stoat assaults with success. Animals like the Rabbit and Squirrel form less of its prey than the smaller rodents. In confinement, the Marten becomes in time gentle. It is sprightly and active, with little unpleasant odor."

Arctic Weasel

Mustela—(Putorius) arctica (*Merriam*)

Other Names.—Ermine, Stoat.

General Description.—A very small, slender and long-bodied Carnivore. Legs short; tail long, moderately bushy, black at the tip; ears of moderate size, soles haired; general color in summer, yellowish-brown above, under parts yellow; in winter, white everywhere except for black tipped tail. Females much smaller than males.

Measurements.—Length, male, 15 inches; tail, 7 inches; hind foot, 2 inches. Females about one-seventh smaller.

The Weasel tribe is numerous and widely distributed, both in this country and in Europe. It contains members differing greatly in size, color and structure. In size it ranges from the New York Weasel, about sixteen inches long, to the Pigmy Weasel, about seven inches. There are, in fact, some thirty species and sub-species now recognized, but the general habits are similar.

Wherever found, it is a bold and inquisitive animal, exhibiting but little fear of man, and poking out its nose from some hole or cranny with the greatest indifference and self-possession. In spite, however, of this curiosity, the Weasel is ever on the alert to withdraw its head at the slightest symptom of attack. Its normal gait is a series of small leaps, stopping at intervals to take a careful survey of its surroundings, and not unfrequently rising on its haunches to obtain a better view. From its elongated, almost snake-like, body it can follow most of the small mammals on which it preys into their holes.

A graceful little bundle of muscle, combined with courage and cunning of a high order—such is the American Ermine, or Arctic Weasel, whose fur is so highly prized.

A glance at the Weasel suffices to betray its dominant traits. The teeth are sharp and needle-like; the jaws are worked by enormous masses of muscles covering all the side of the skull. The forehead is low, the nose sharp; the eyes are small, penetrating, cunning, and glitter with an angry green light. "There is something peculiar, moreover, in the way that this fierce face surmounts a body extraordinarily wiry, lithe and muscular. It ends a remarkably long and slender neck in such way that it may be held at right angle with the axis of the latter. When the creature is glancing around, with the neck stretched up, and flat triangular head bent forward, swaying from one side to the other, we catch the likeness in a moment. It is the image of a serpent."

Audubon, one of our earliest and most careful observers, thus describes the Ermine: "Graceful in form, rapid in his movements, and of untiring industry, he is withal a brave and fearless little fellow; conscious of security within the windings of his retreat among the logs, or heap of stones, he permits us to approach him within a few feet, then suddenly withdraws his head. We remain still for a moment, and he once more returns to his post of observation, watching curiously our every motion; seeming willing to claim association so long as we abstain from becoming his persecutor. Yet with all these external attractions, this little Weasel is fierce and bloodthirsty, possessing an intuitive propensity to destroy every animal and bird within its reach, some of which, such as the American rabbit, the ruffed grouse, and domestic fowl, are ten times its own size. It is a notorious and hated depredator of the poultry house, and we have known forty well grown fowls to have been killed in one night by a single Ermine. We have traced the footsteps of this bloodsucking little animal on the snow, pursuing the trail of a fleeing Rabbit, and although it could not overtake its prey by superior speed, the timid hare soon took refuge in the hollow of a tree, or in a hole dug by the Marmot or Skunk, thither it was pursued by the Ermine and destroyed, the skin and other remains at the mouth of the burrow bearing evidence of the fact."

The Weasel can be employed, in the manner of a Ferret, in driving Rabbits from burrows. In one instance the Ermine employed had been captured only a few days before, and its canine teeth were filed, in order to prevent it destroying the Rabbit. A cord was placed around its neck to secure its return. It pursued the Hare through all the windings of its burrow, and forced it to the mouth, where it could be taken in a net, or by the hand.

The color of the fur in summer is of a reddish-brown above and sulphur-white below. In the northern latitudes the color change is very marked. In the late autumn the coat is shed very rapidly and replaced by a much longer and denser white one for winter, except the tip of the tail, which is black.

The nature of the change from the dark summer to the white winter dress has given rise to much discussion. It was originally considered that the animal sheds its coat in the autumn and spring; the dark summer coat being gradually replaced by the advent of the white hairs of the winter one. Doubts then arose whether the change in color was always coincident with the development of the winter and summer coat, and whether the hairs themselves might not actually change color. Dr. Coues succeeded, however, in proving that the change might take place in either way, some specimens taken in spring showing the long, woolly white winter coat on some parts of the body, while on other parts they had the short, coarse, brown hair of summer; and he observes that "we may safely conclude that if the requisite temperature be experienced, at the periods of renewal of the coat, the new hairs will come out of the opposite color; if not, they will appear of the same color, and afterward change; that is, the change may or may not be coincident with the shedding." Dr. Coues attributed the reason of the color-change entirely to the effect of temperature; but strong objection is taken to this view by Dr. Merriam, who observes that it occurs in captive specimens kept continually in warm rooms. Dr. Merriam, however, states that the winter change never takes place till after the first fall of snow, which generally occurs toward the end of October or the beginning of November. Although the temperature of the air may be much lower before than subsequent to this first snowfall, yet it is true "that Ermine caught up to the very day of the first appearance of snow bear no evidence of the impending change. Within forty-eight hours, however, after the occurrence of the snowstorm the coat of the Ermine has already commenced to assume a pied and mottled appearance, and the change now commenced progresses to its termination with great rapidity. In early spring, the period for the reversal of this process, the changing back from its white coat of winter to the brown summer coat, is determined by the same cause—the presence or absence of snow."

Like a majority of predatory animals, the Weasel is nocturnal in its habits. Nevertheless, it is too often abroad in the daytime, either in sport or on the chase, to be classed among the truly nocturnal animals. In the choice and construction of its retreats we see little evidence of burrowing instincts. It retreats beneath stone heaps in dense thickets, under logs and stumps, in hollow trees, and also in burrows, though these are usually those made by other animals that it has driven off or destroyed.

New York Weasel

Mustela noveboracensis (*Emmons*)

General Description.—See Arctic Weasel. One of the larger Weasels of the United States. Dark in color, in summer, and with a long tail, usually one-third entire length. Black tip.

Measurements.—Male larger than female; length usually 16 to 18 inches for male, and 12 or 13 inches for female.

One of the best known Weasels, because living near home to many Eastern people, is the New York Weasel. Its habits resemble other related species, one of its nearest relatives being the Mountain Weasel of the West. The New York Weasel is to be found from Maine to the Mississippi River. It is one of the larger types, being about sixteen inches long. It is dull brown in color above, and white below, changing to white in winter, except for the final one-third of the tail, which remains black.

Despite its destructive habits, this Weasel is rather a benefactor than an enemy to the farmer, ridding his granaries and fields of many prowlers. A mission appears to have been assigned to it by Providence to lessen the rapidly multiplying number of mice and other small rodents. Wherever the Weasel appears, the mice for half a mile around rapidly diminish in number. Their enemy is able to force its thin worm-like body into the burrows, it follows them to the end of their granaries, and destroys whole families.

When angered the Weasel emits a penetrating and disagreeable odor, common to its family.

The mother Weasel's courage in defending her young against all odds is well known. The nest is constructed of dry leaves or moss in a stone heap, or log pile, or hollow log. There are two or three litters each year, with four or five young at a birth. The young develop very rapidly.

The Weasel is a skillful climber, darting along the limbs of trees with the nimbleness of a Squirrel. Not content with seeking its prey on the ground it will pursue birds through the trees.

Dr. A. K. Fisher says: "The Weasel is one of Nature's most efficient checks upon the hordes of meadow mice and other rodents, which at times destroy forage, crops, orchards, vineyards, and garden produce. It feeds also upon rabbits, squirrels, and birds, and in many sections its occasional inroads on the poultry yard have brought it into serious disrepute. It is, of course, desirable to kill particular individuals which have acquired the poultry habit, but farmers and horticulturists will make a mistake if they systematically destroy Weasels."

NEW YORK WEASEL IN WINTER PELAGE
FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

AMERICAN MINK

MUSTELA VISON *Schreber*

GENERAL DESCRIPTION.—Body Weasel-like; heavier and considerably larger than a Weasel; legs short; head broadly triangular in shape; tail about 1/3 length of body, bushy; ears short; soles hairy; foot-pads naked; five toes in front and behind. Females considerably smaller than males. General color dark brown.

MEASUREMENTS.—Length, male, 24 inches; tail, 7 inches; hind foot, 2½ inches. Weight, 2 pounds. Females, smaller; weight, 1 pound 10 ounces.

In both Europe and America, the Mink is semi-aquatic, being commonly at home in districts where water is found. In its water-loving propensities, it may be regarded as bearing the same relationship to the Polecat as is held by the Water-Vole to the Land-Vole. "The Mink," writes Dr. Merriam, "not only swims and dives with facility, but can remain long under water, and pursues and captures fish by following them under logs or other places from which there is no escape. It has thus been known to catch as swift and agile a fish as the brook-trout, and Audubon says that he has seen a Mink catch a trout of upward of a foot in length. It is remarkably strong for so small an animal, and a single one has been known to drag a mallard duck more than a mile, in order to get to its hole, where its mate joined in the feast." Generally, the food of the Mink consists of various aquatic creatures, such as frogs,

MINKS

From a habitat group in the American Museum of Natural History crayfish, and mollusks; but it will also eat various small aquatic mammals, such as voles, as well as mice and rats. Marsh-frequenting birds also fall victims to the Mink, and their eggs are probably also consumed. Other wild birds are, however, comparatively safe from the attacks of this animal, as its climbing powers are of the feeblest. Poultry are not unfrequently attacked; but in these and other attacks the Mink does not exhibit that wholesale destructiveness characteristic of the Ermine. In hunting, the Mink has been often observed to pursue its prey entirely by scent; and it may be observed on its hunting expeditions both by night and by day.

As a rule, Minks appear to be comparatively solitary animals; rarely are more than two seen in company. The abode of the Mink is usually a hole in the bank of a stream or lake; and a well-trodden path always leads from the entrance of the burrow down to the water. From such abiding places the animal will not only make daily excursions for the sake of procuring food, but also wander into neighboring districts from which it sometimes does not return till after the lapse of a week or two.

Minks have been extensively bred in captivity for the purpose of being used as Ferrets, and in this condition it appears that the number of young in a litter may vary from three to as many as ten. The scent characteristic of all the members of the Weasel group is extraordinarily developed in the Mink, Dr. Coues observing that no animal, with the exception of the Skunk, possesses such a powerful, penetrating, and lasting effluvium.

"The movements of the Mink on land," says Elliot Coues, "though sufficiently active, lack something of the extraordinary agility displayed by the more lithe and slender-bodied Weasels, as a consequence of the build of its body; while, for the same reason, it does not pursue the smaller animals into their extensive underground retreats, nor so habitually prowl about stone heaps and similar recesses. It is altogether a more openly aggressive marauder, though not less persistent and courageous in its attacks. It appears to be more perfectly at home in the water, where it swims with exactly the motions of an Otter, and in fact appears like a small specimen of that kind. It swims with most of the body submerged—perhaps only the end of the nose exposed—and progresses under water with perfect ease, remaining long without coming to the surface to breathe."

The Mink is not properly a migratory animal. In most sections it remains permanently where it takes up its abode. In others, however, it may be forced to remove at times, owing to scarcity or failure of its food-supply, such as may ensue from the freezing of the waters in northern parts. Under such circumstances, it may perform extensive journeys overland.

The mating season begins early—generally in February—and April is for the most part the month of reproduction. Five or six young are ordinarily produced at a birth, and the young remain with their mother through the summer. Litters have been found in the hollow of a log, as well as in the customary burrows.

The Mink has been frequently tamed, and is said to become with due care perfectly gentle and tractable, though liable to sudden fits of anger, when no one is safe from its teeth. Without showing special affection, it seems fond of being caressed, and may ordinarily be handled with perfect impunity.

Minks are not burrowing animals in a state of nature, but freely avail themselves of the holes of Muskrats and other rodents. They cannot climb a smooth surface, but ascend readily where there is roughness enough for a nail-hold. Tame Minks make excellent ratters, hunt vigorously, and soon exterminate the troublesome pests. Rats will make off on scenting them; they are so bewildered in flight that they give no battle, but yield at once; and the Mink severs the main vessels of the neck so quickly that an observer would scarcely imagine the deed had been done.

LARGE STRIPED SKUNK

MEPHITIS MEPHITIS (*Schreber*)

GENERAL DESCRIPTION.—A large robust-bodied animal as large as a cat, with coat of clear black and pure white. Body thick-set; legs rather short; tail bushy; claws curved; ears short; musk glands exceedingly well developed; soles nearly wholly naked; color black all over, with the exception of broad white stripe from head along back and onto tail; white line down forehead to nose.

MEASUREMENTS.—Sexes about the same. Length, 24 inches; tail, 8 inches; hind foot, 3 inches. Weight, 7 to 8 pounds.

THE Striped Skunk is among the handsomest animals of the fields, but being a wanderer of the night, he is not so frequently seen as the Squirrel or Woodchuck. However, he is not strictly a nocturnal animal and may be found wandering about the fields in broad daylight, by the unwary.

The Skunk, like many other animals, is known in different localities by special names, such as "wood-pussy," "essence-peddler," and "polecat." Unlike most other animals, it has increased rather than decreased in numbers in the rural districts, for civilization has diminished its natural enemies and increased the food resources.

It is perfectly fearless of man and other animals, and if allowed to go its way undisturbed, will pass close to you with a genteel and dignified indifference, attending strictly to its own business; but, if interfered with or followed closely or suddenly alarmed, it will prepare for self-protection, and woe to the man or animal insisting on disturbing it too much. Such implicit confidence has the animal in its own ability to defend itself that it wanders about as boldly as though lord of all it surveys.

That which particularly distinguishes the Skunk from other animals is its means of defense, which is a musky secretion having a most powerful and disagreeable odor. In addition to its terrible odor, the fluid is so intensely acid that it burns the skin like fire. In extreme cases such a discharge has been known to produce blindness. The fluid is yellow in color, somewhat phosphorescent, and resembles musk in its extraordinary volatility. The discharge at any one time is scarcely three drops, yet this small quantity will perfume the air for a half mile or more in every direction. The fluid or secretion employed by the Skunk in protecting himself is stored in two glands located under the tail, and may be ejected by muscular contraction to the distance of about ten feet. The contents of the glands are discharged, probably one or both at a time, as the occasion demands, in the form of a very fine spray. When the Skunk is facing you there is no danger that he will discharge his artillery. It is

EASTERN SKUNK
FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

only when he turns tail toward the enemy that there need be alarm. Many believe that the Skunk scatters the essence with his tail, but this is entirely incorrect, for the Skunk is a very cleanly animal, and during the discharge the tail is arched high above the back to keep it undefiled. If he were to wet his tail with the essence, he would attract many enemies in the vicinity, and without doubt it is a matter of both prudence and comfort for him to remain free from the stench. The Skunk is provided with a special apparatus for discharging the fluid, which is connected with the ducts leading from the glands, and the apparatus is ejected a short distance from the end of the digestive tract when the essence is to be delivered. This arrangement easily explains the absence of the odor on the Skunk immediately after using its weapon of defense.

Skunk fur has always been in demand, and for several years past the price has greatly increased. The black fur is the more valuable, but the coloring of fur is now so largely practiced that it makes little difference how much white there is, for the skins all go through the dye to make them uniform in color. After dyeing, cutting, and making, few suspect that the fashionable "Alaska Sable" furs in our city shop windows come from little bicolored animals, called "wood-pussies" by the country folk.

The home of the Skunk is usually in a burrow in the forest which it digs with its powerful claws, but it may also take possession of a deserted Woodchuck's burrow, a cave, hollow log, or a stone wall. The den contains a large bed of grass and leaves, and here the young are born in the spring. When the young are about a quarter grown, they follow the mother on night excursions in search of food, and while moving from place to place they go in single file, forming in line fifteen to twenty feet in length. The young may be captured in the following manner. The would-be captor takes his place behind the line, and noiselessly approaches the rear Skunk, lifting it quickly from the ground by the tail. This may be nervous work for the novice, but is entirely safe, for when the Skunk is thus lifted from the ground the power of spraying the essence is apparently lost. It takes a steady nerve to approach an old Skunk and lift it by the tail, and although I have heard of several instances, I have but once actually seen it accomplished.

If the young are captured while small and are constantly handled and petted, they show a considerable degree of affection, and at times are very playful.

Skunks have no way of expressing their joy, like the cat or dog, for the young and old alike are nearly voiceless, with the exception of an occasional little squealing or grunting noise.

The Skunk lives upon animal food, but in summer it is largely made up of insects, in particular grasshoppers. The number of insects a single one will destroy is beyond comprehension. The Skunk is one of the most efficient aids of the agriculturist, yet, when he takes up his abode under the barn, there is sure to be trouble among the fowls unless they are well housed, the greatest loss being among chickens. The mother hen may have a dozen little ones tucked away at night under protecting wings, and before morning a skillful paw may remove half the number, or more, leaving only the slightest trace of their unhappy end. The location of the mother hen and her remaining chickens must be changed, for Mr. Skunk will continue his nightly visits until the whole family is devoured. Other domestic fowls suffer in much the same way from such depredations. The ground-nesting birds probably pay a heavy tribute, both in eggs and in young, to this robber of the poultry yard. The few chickens he may destroy (not one Skunk in 500 ever tastes chicken) is his compensation for the destruction of field mice, beetles, and various forms of vermin, yet he is killed by the average farmer, whose prejudice is only exceeded by his ignorance of this most beneficial animal.

There is a general belief that the Skunk hibernates during the winter. It does hibernate, but the period of hibernation is not as continuous or deep as in the case of many animals. The period of rest is broken several times during the winter, whenever the weather becomes mild for two or three days at a time. This season of inactivity becomes more pronounced the farther north we go, but the degree of it corresponds with the severity of the weather. S. A. LOTTRIDGE.

CANADA OTTER

LUTRA CANADENSIS (*Schreber*)

GENERAL DESCRIPTION.—Very large for one of the *Mustelidæ*. Body long; legs short; toes webbed; soles of feet hairy; tail long and rounded, thick at base and tapering; head broad and flattened; nose short; general color brownish; dense under-fur. A very strong-muscled, lithe and active animal.

MEASUREMENTS.—Sexes nearly equal. Length, 40 inches; tail, 12½ inches; hind foot, 4 inches. Weight, 20 pounds.

THE Otter is an aquatic animal which swims and dives with great readiness, and with peculiar ease and elegance of movements; and although its action on land is far from awkward and difficult, yet it is certainly in the water that the beautiful adaptation of its structure to its habits is most strikingly shown. It swims in nearly a horizontal position, and dives instantaneously after the fish that may glide beneath it, or pursues it under water, changing its course as the fish darts in various directions to escape from it, and, when the prey is secured, brings it on shore to its retreat to feed. As the Otter lives exclusively on fish, when it can procure them, it frequents lakes, rivers, smaller streams, ponds, and not unfrequently descends to the sea; and the havoc which it makes among the finny inhabitants is almost incredible. In feeding, it holds the fish between its fore-paws, eating first the head.

Otters are generally found either in pairs or in family parties of five or six. Their homes are made in or near the banks of a river or lake, the hollows beneath the roots of trees growing on the margin being special favorites, while in hilly districts the clefts between rocks are selected, and where the soil is of an alluvial nature deep burrows, with several entrances, one of which usually opens beneath the water, are excavated in the banks.

Otters apparently never hibernate, and in consequence must be hard pressed to supply themselves with food during the winter in the colder portions of their habitat. At such times they may make occasional raids on the farmyards. Water-fowl are probably also attacked at such periods, while eggs are always acceptable. In addition to fish, Otters are fond of frogs and shellfish.

Courtesy of New York Zoological Society

OTTERS

From a photograph by E. R. Sanborn

The number of young in a litter is usually two, although there may be either one or three. They are born about the middle of April, and during the summer and autumn the young stay with their mother.

The fur of the Otter, Coues says, is of great beauty, very thick, close, short and shining. The longer hairs are stout and glistening; the very copious under-fur is soft and lusterless. The sheen is only visible in its perfection when the pelt is viewed with the lay of the hairs; from the other direction the color is plain. The roots of the hairs, even on the darkest part of the pelage, are light brown, or dingy white, but the fur is so close that this does not appreciably affect the rich brown tone of the surface.

According to Richardson, one of the earliest authors giving accounts of the species with precision, "The Canada Otter resembles the European species in its habits and food. In the winter season, it frequents rapids and falls, to have the advantage of open water; and when its usual haunts are frozen over, it will travel to a great distance through the snow, in search of a rapid that has resisted the severity of the weather. If seen, and pursued by hunters on these journeys, it will throw itself forward on its belly, and slide through the snow for several yards, leaving a deep furrow behind it. This movement is repeated with so much rapidity, that even a swift runner on snowshoes has much trouble in overtaking it. It also doubles on its track with much cunning, and dives under the snow to elude its pursuers. When closely pressed, it will turn and defend itself with great obstinacy."

Sliding seems to be a favorite amusement of this creature. Audubon observed: "The Otters ascend the bank at a place suitable for diversion, and sometimes where it is steep, so that they are obliged to make an effort to gain the top; they slide down in rapid succession where there are many at a sliding place. On one occasion we were resting on the bank of Canoe Creek, a small stream near Henderson, which empties into the Ohio, when a pair of Otters made their appearance, and not observing our proximity, began to enjoy their sliding pastime. They glided down the soap-like muddy surface of the slide with the rapidity of an arrow from a bow, and we counted each one making twenty-two slides before we disturbed their sportive occupation."

The general intelligence of the Otter is of a high order, and his docility is such that he may not only be thoroughly tamed, but taught to work for his master. Audubon speaks of four American Otters which were so tame that they would answer a whistle like dogs, and became very agreeable as well as useful pets.

THE CAT FAMILY

(*Felidæ*)

THE family of Cats is one of the most sharply defined of all the Carnivores, or flesh-eating animals. Whether seen in its most familiar form, the House Cat, or in the larger members from the jungle, such as the Lion or Tiger, the strong family traits can instantly be recognized. These are not only found in the peculiar shape of the skull and the appearance of the face, but also in certain characteristic habits, such as washing the face, "sharpening" the claws, and contracting the pupils of the eyes.

The Cats have long, sharp, retractile claws. The feet are digitigrade, with five toes on each fore foot, and four on each hind foot. The soles are hairy, and pads naked. The papilæ, or little projections with which the tongue is covered, are sharp, horny, and turned backward. The powerful jaw is armed with a large shearing tooth, or carnassial. The skull is short and broad, with a very short face.

In America there are four or five typical large members of this family living in a wild state.

COUGAR

FELIS COUGAR *Kerr*

OTHER NAMES.—Panther, Puma, Mountain Lion, Catamount.

GENERAL DESCRIPTION.—A very large, cat-like animal with a long tail. Body long and lithe; legs moderately long; tail long and round, more than half the length of head and body; claws long, sharp curved; soles haired, pads naked; general color pale tawny brown above, dirty white below; tail tipped with black; ears prominent, without tufts of long hair. Young spotted.

MEASUREMENTS.—Length, 7 feet; tail, 30 inches; hind foot, 10 inches. Sexes about equal, the male about a foot longer than female. Weight of male, 200 pounds.

NEXT to the Jaguar, the Cougar is the largest of the American Cats. In color the adult is a tawny brown, becoming lighter on the lower surface, and without any spots at all. But the odd thing is that its young are marked all over with large blotches of blackish-brown, while their tails are ringed with black like that of the Tiger. And these markings do not disappear until the animal is more than six months old.

The Cougar is found in western parts of the American continent, from British Columbia in the north to Patagonia in the south, and it is even said to have been seen in Tierra del Fuego. Being so widely distributed it rejoices in several names. In the Northwest they call it the "Mountain Lion," in the Southwest the "Cougar"; the Mexicans and South Americans know it by the sobriquet "Puma"; to the naturalist it is *Felis* several things; J. Fenimore Cooper names it the "Varmint," and in the Gulf States it answers to the chill-producing name of "Panther," while the early settlers in the East called it the "Catamount," and the "Painter"; but whatever the name and whatever the locality, it is one and the same Cat.

His range is greater than that of any other member of the Cat family and extends for over a hundred degrees of latitude, from northern Canada to the Argentine, and before civilization drove them back they were found from the Atlantic to the Pacific in considerable numbers. They are hardy and tenacious, and adapt themselves to all conditions of climate.

Calves, colts, sheep, dogs, chickens, in fact any kind of flesh is the Cougar's diet; it shows a pronounced preference for lamb, but when famished will not hesitate to attack a steer. Its midnight raids are carefully planned, its descent on the prey is quick, sure and deadly; it takes no chances, and when opportunity offers will kill more than it can possibly consume, wantonly satisfying its lust for blood. These great Cats live in communities, each group ranging over a certain zone, usually along both sides of a valley for many miles of its length. The group consists of one male and from five to ten females, each with her own lair.

The female is nearly as large as the male, and is his counterpart in appearance. She picks a permanent abode, a pile of loose rock, under and through which she can crawl. Here with but one possible entrance to guard, she rears her young, and this guardianship is her most serious business in life, for when the litter has been born the male will watch for a chance to kill them.

COUGAR

From a photograph by Dan J. Singer

The Cougar takes readily to the trees, being a much better climber than the Jaguar. But it almost always hunts upon the ground, trying to creep stealthily up to its victim, and to spring upon it before its presence is even suspected. It scarcely ever ventures to attack a man, but will follow him for a long distance as though waiting an opportunity to pounce upon him unawares. But if he suddenly turns and faces the animal, it will always slink away, even if he is quite unarmed. Sometimes, too, it will allow itself to be killed without attempting to defend itself at all; so farmers have a rather poor opinion of its courage. The farmers, however, have very good reason for dreading the animal, for it is a terrible enemy to sheep, and has been known to kill as many as fifty in a single night.

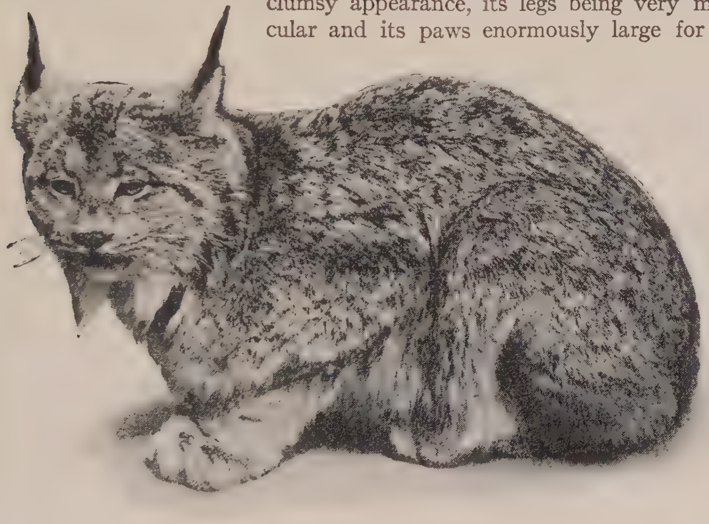
Canada Lynx

Lynx canadensis *Kerr*

General Description.—A stout-bodied, long-legged Cat about the size of a good-sized Cocker Spaniel. Ears prominent, tufted; fur dense and long; feet very large; claws sharp and strong; tail very short and blunt; legs very long, giving animal a grotesque appearance; a ruff of long hairs on sides of head.

Measurements.—Length, 36 inches; tail, 4 inches; hind foot, 9½ inches. Male rather larger than female. Weight of male, 25 to 40 pounds.

The Canada Lynx is one of the most widely known of northern animals. It is the "Lucivee" (*Loup cervier*) of French-Canadians, and has a clumsy appearance, its legs being very muscular and its paws enormously large for its lean body. The color of its coat is usually a dark gray with chestnut tinge, and the shading renders it indistinct against any background. It is extremely wary and timid, and possesses the faculty of concealment to a wonderful degree. It will flatten itself out on a limb so that it is almost concealed, and only the most vigilant and well-trained



CANADA LYNX

From a photograph by E. R. Sanborn

Courtesy of New York Zoological Society eye can discover him. Its main food consists of cotton-tail rabbits, mice, and small birds; it is partial also to the heads of grouse, and it delights in a small deer. It is very clever in unearthing deer, sheep, and young pigs which the Cougar has hidden away for future consumption.

Strangely enough, although such a powerful animal, the Lynx is not by any means tenacious of life, a slight blow on the back sufficing to kill it. It is a very good swimmer. Mr. Edward A. Preble, when in the upper Mackenzie region, saw one cross the Nahanni River. "It swam readily in the swift current, and on reaching the shore bounded away into the forest, apparently little fatigued by its violent exertions." In the same region "the Indians capture the Lynx by snaring, the noose being made of heavy twine or babiche."

Unlike the Bobcat, the Canada Lynx seldom invades the farm-yard; it dwells in the deep forests far from the haunts of man. Stone and Cram think that the Lynx "must necessarily go without food often for days together in the winter, glad enough perhaps to pull some frozen scrap of flesh or skin out of the snow, dropped there by some more fortunate hunters weeks before." In the summer the Lynx makes its home in tangled thickets of young growth.

The Lynx is found as far south as the Adirondack Mountains. In the Adirondacks, where it is nowhere common, it preys, according to Dr. C. Hart Merriam, "upon the northern hare, and such other small mammals as it can catch, and upon the ruffed grouse and spruce partridge. It has been known to devour pigs, lambs, and young fawns; but the accounts of its attacking full-grown deer are not to be credited. Its haunts are in the deep forests and bush districts, remote from the paths of man; and consequently it rarely intrudes upon the barn-yard. Its ordinary gait when in a hurry is a long gallop, like that of the hare, and it is said to swim well. The female commonly has two young at a birth, her lair being located in a cavern or hollow tree."

Wild Cat

Lynx ruffus (*Güldenstaedt*)

Other Names.—Bobcat, Bay Lynx, Red Lynx,

General Description.—Very similar to Canada Lynx, but rather smaller and with detailed differences. Form thick-set; legs long, tail short but longer than that of the Canada Lynx; ears prominent but not conspicuously tufted; feet large, but smaller than those of Canada Lynx; ruff of hair on side of head. General color pale rufous-brown, spotted on sides with dark-brown; fur soft and full.

Measurements.—Length, 36 inches; tail, 6½ inches; hind foot, 7 inches. Weight, 20 pounds.

THE distinguishing feature of the Wild Cat is its short and rather bushy tail. Compared with the domestic Cat, it stands somewhat higher, and has a coarser and rougher head. It is an inhabitant of the United States eastward of the Great Plains, with allied varieties in Nova Scotia, Florida, Texas, and California. Its fur, which is rather heavy and thick, is usually of a yellowish-brown color with a reddish tinge, and a blackish stripe down the back; the under parts are white, spotted with black. There are also spotted varieties.

Wild Cats feed upon mice, squirrels, rabbits, grouse, and various small birds, and, not having the perseverance of the Weasel and Fox in pursuing, they lie in wait for their prey, springing out suddenly upon it. In settled districts they invade the farm-yards, carrying off chickens, ducks, geese, and turkeys, as well as little pigs and lambs. As, however, they are first-class mousers, it is probable that they more than repay, by their destruction of noxious rodents, the depredations they themselves commit.

Wild Cats during most of the year hunt either alone or in pairs, and they do most of their roaming in the evening and morning twilights, sleeping during the day in the hollow of some tree, or in a cave, or even in the nest of a large bird. Their own nests, which are well-lined with moss, are found in hollow trees and logs. Their young number two to four.

Wild Cat hunting with dogs is a favorite sport in certain parts of the South. The hunters usually take their stands in open spots and wait for the dogs to drive the game within shot. The Wild Cat rarely trees, but usually, rabbit-like, runs round and round in a limited circle, depending on outrunning or dodging the dogs. Mr. Vernon Bailey once shot a Wild Cat in front of the hounds as it passed him for the third time.

The Desert Wild Cat, another well-known species, is of tawny hue which matches well with its barren surroundings. Its habits do not differ greatly from others, beyond the change necessitated by local conditions. It is a lithe, bloodthirsty animal that spends many of its waking hours stalking its prey.

THE SQUIRREL FAMILY

(*Sciuridæ*)

WHO does not know and like the Squirrels? Busy, frisking, bright-eyed and graceful, they are among the most interesting neighbors of the woodland. In our public parks they easily become so tame as to approach the passer-by and "hold him up" for food. And yet the Squirrels if unrestricted might become a pest. Their gnawing habits and their tendency to rob birds' nests are points against them. In England they have not been protected, or made such pets, as in this country.

Members of this family include the Squirrels, Flying Squirrels, Ground Squirrels, Chipmunks, Marmots, and Prairie Dogs. Their chief family resemblances are rounded and bushy tails, which are never scaled. They have twelve or thirteen ribs. Their first upper premolar teeth are very small. The family is a large one, with members widely scattered.

EASTERN GRAY SQUIRREL

SCIURUS CAROLINENSIS *Gmelin*

GENERAL DESCRIPTION.—A large, bushy-tailed tree Squirrel. Head rounded; ears of moderate height, covered with short hairs; body large but not heavy; tail about half the total length, very broad and bushy; legs fairly short; color yellowish-rusty above; white below; pelage soft. An animal of much more quiet behavior than the Red Squirrel.

MEASUREMENTS.—Total length, 18 inches; tail bones, 8.5 inches; hind foot 2.51 inches.

THE Eastern Gray Squirrels range from New York south along the entire Atlantic seaboard and as far west as the edge of the Plains. The group is divided into five sub-species based mainly on color characters and size differences. Some of these sub-species have a black color-phase or melanistic form in which the animal is black all over, but these are rarer.

The home of the Gray Squirrel in the East is usually to be found in the hollow of a maple, birch, or beech tree, with the entrance among the branches forty to sixty feet from the ground. In the West it frequents the oak and pine. This is the real home, although often a summer house is constructed, which is generally located in the same tree with the other home; so that if the Squirrel becomes frightened, it may run for shelter to the more secure dwelling in the hole of the tree. The summer home may be built for convenience during the time that the young are being reared; perhaps it is built for sanitary reasons; the temperature may be very much less during the hot weather; or it may be a pleasure house, for a tenting-out period that is so much enjoyed by some of the higher animals. Who knows? The material of the summer house varies considerably, but consists chiefly of sticks, bark, leaves, with a lining of grasses or some other material. The entrance is on the side, the nest from below resembling that of a crow.

The Gray Squirrels do not lay up for winter use quantities of nuts or other food, as do the Chipmunks, for they do not hibernate. When the weather is not severe they roam abroad during the winter. However, the Gray Squirrel, in common with most of our other Squirrels, has the habit of digging holes and hiding a nut or two here and there. It has been argued that this is an idle pastime, and that nuts so concealed in many places could never again be located by the Squirrel, but it must be remembered that the sense of smell is very acute, probably guiding the animal more than memory. It must be this wonderful sense of smell that directs the Squirrel where to dig in the snow, securing from beneath the leaves the nuts that were buried weeks before; or that guides him to a solitary nut tree, or to the grain in a barn.

This stored food constitutes only a part of the Gray Squirrel's winter supply. The other part he must scurry about to find. The beech trees and some others do not drop all of their nuts at the approach of winter. There still hang a few solitary nuts on each tree, and through a large beech forest the number so left is considerable.

The Gray Squirrel has enemies in feathers, such as the goshawk and the red-tailed hawk. A single hawk, however, can scarcely catch a Gray Squirrel, especially if the Squirrel remains on the tree trunk, which he probably will be wise enough to do, thus being enabled, by dodging, to evade the hawk's claws.

GRAY SQUIRREL EATING A NUT

From a photograph by G. Clyde Fisher

The Gray Squirrel is readily tamed, or semi-tamed, and lives contentedly in the city parks. It will come close to the visitor, and may be even persuaded to climb one's coat and eat out of the hand. When alarmed, it utters a peculiar rasping cry or bark. Many believe it is an arrant coward, being readily driven off by its smaller red cousin, but there is some doubt about this.

The family of the Gray Squirrel is usually five in number.

Silas A. Lottridge.

EASTERN RED SQUIRREL

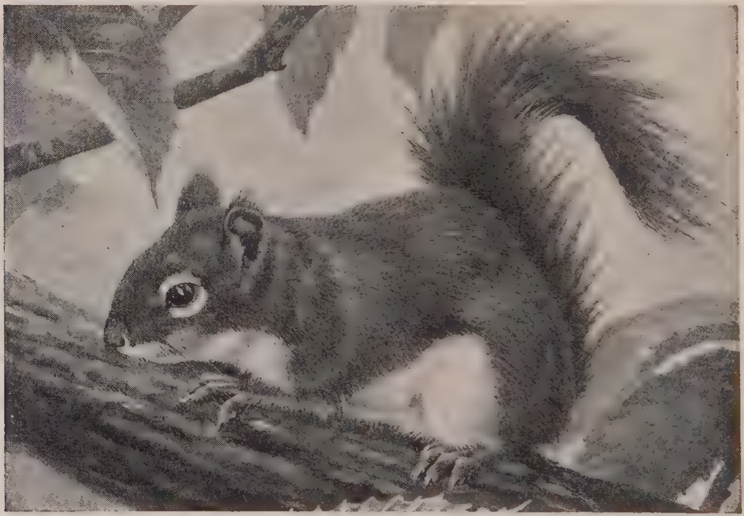
SCIURUS HUDSONICUS (*Erxleben*)

OTHER NAMES.—Chickaree, Pine Squirrel.

GENERAL DESCRIPTION.—A medium-sized Squirrel with bushy tail. Head blunt and rounded; ears fairly large and broad, clothed with short hair; body of moderate size; tail nearly as long as head and body, broad and bushy; feet of moderate length, soles furred, pads naked; general color above, yellowish-rufous in summer, chestnut-rufous in winter. Temperament, nervous and active.

MEASUREMENTS.—Total length, 12 inches; tail bones, 5.5 inches; hind foot, 1.8 inch.

THE Red Squirrel in some of its related forms is found in nearly every timbered area in North America. This group of medium-sized Squirrels is divided naturally into several sub-groups clearly distinguished by strong color differences. Altogether about twenty species and subspecies of Red Squirrels range north of the Rio Grande and fall easily into three divisions: the first, or Eastern Red Squirrel group, in which all the members are clear white below and generally some tone of chestnut, or rufous-brown above; the Douglas Red Squirrel group, in which the members are bright orange below and reddish above; and the Fremont's Chickaree group, in which the members are grayish-white below and gray above.



EASTERN RED SQUIRREL

FROM A DRAWING BY GEORGE A. KING

The Red Squirrel is the most frolicsome, alert, curious and "sassy" of the family to which he belongs. His home is usually in a hollow tree or among the roots, but sometimes he constructs a summer nest of twigs and leaves, located on lofty branches in the forest; but if in an old apple-tree, it is usually not more than fifteen feet from the ground.

Nuts form the chief food of the Red Squirrel, but berries, roots, fungi, fruits, seeds of the pine, and, occasionally, animal food, are also eaten. Even in the coniferous forests he, with his intelligence, industry, and faculty of adapting himself to circumstances, lives and thrives. If the annual nut crop fails, the other Squirrels are forced to migrate; not so with the Red Squirrel, or Chickaree, as he is often called, for he can subsist upon buds, roots, and even mushrooms—in fact, he is very fond of the last named. Just how a Red Squirrel knows the difference between the poisonous and the non-poisonous varieties has always been a mystery. Mushrooms decay quickly if not gathered at the proper time, and the Red Squirrels, who know this as well as we do, harvest them accordingly. There are also the barberries, chokecherries, partridge berries, and greenbrier berries which they add to their store, and last, but quite important in many localities, are the seeds from the cones of the hemlock, pine, and spruce.

But the food question is far from being settled for the Red Squirrel, even after the supply which has cost him days and days of arduous toil is gathered, for he has thieving neighbors constantly watching to take advantage of his thrift. He suffers little from his own kind, for each Red Squirrel is supposed to have a certain territory that belongs to him, and trespassers upon another's preserves are promptly driven away; also he easily vanquishes his larger cousin, the Gray Squirrel, but there are many other hungry wood folk not so easily disposed of, such as the thieving blue jays, which know neither bounds nor limits, and which are ever on the alert for tempting morsels. The Red Squirrel has learned through bitter experience that it is better to have various storehouses for his supplies. Nature and stern necessity have taught him to make ample provision in the season of abundance for the long cold winter that is to follow, and the quantity of food stores is often quite large. Sometimes as much as a bushel and a half of nuts have been taken from a hollow tree occupied by a pair of Red Squirrels. This probably was the main storehouse, but undoubtedly there were lesser ones which would have considerably increased the amount.

Annoying as the blue jay is, he is a real friend to the Squirrels and other wood dwellers. The Red Squirrel, being a constant target for gunners in some localities, is very shy, and the jay often sounds an alarm note when the hunter is some distance away, thus warning the Squirrel in time to scamper away and hide until the danger is past. The blue jay, and in the northland the Canada jay, have caused the hunters to lose many a good shot, not only at small game, but more particularly at members of the Deer Family.

The Red Squirrel is an expert on the subject of nuts, not only in selecting sound and good ones, but also in the manner and certainty with which he gets at the kernel.

In certain parts of the country the Red Squirrel makes inroads upon the farmer's storehouse of grain, and sometimes it ventures even so far as to make a nest for itself in some of the outbuildings.

Although the Red Squirrel is a good provider, food sometimes becomes extremely scarce in the north country, if the spring is very late, and his hunger drives him to drink. He does not slake his thirst at the mountain stream, but taps a maple tree and later the birch. With his sharp, chisel-like teeth he makes an incision in the bark, either upon the tree trunk or upon the upper side of a limb. The cut in the bark forms a small cavity, in which the sap collects, and as the capacity is small, there may be two or three "drinking fountains" on the same tree.

He is abroad at nearly all times of the day, but retires early, except in the busy nutting season, when he keeps late hours. This Squirrel combines qualities so entirely dissimilar that he is clearly the puzzle of the forest. His wonderful inquisitiveness, his exasperating insolence, coupled with all disregard for the ordinary civilities of the wood folk, stamp him "the black sheep of the flock." If you disturb him in your walk, he mounts the nearest tree, and from a limb just out of reach he literally boils over with rage and indignation, jerking his tail and stamping the limb furiously, calling "*chickaree, chickaree, chickaree!*" He barks and spits, and probably says things in Squirrel language that would sound very dreadful in English. He makes little dashes, first this way, then that, as though he intended to come down the tree and run you from the premises. He has no more respect for a man than for a dog, and if you sit down and remain motionless, he may either pay no attention to you at all, or his insolence may know no bounds, so fickle and changeable is his disposition.

Many claim that the Red Squirrel is the bird's most deadly enemy, destroying both eggs and young; others are equally positive that the Squirrel does not meddle with nesting birds. I do not precisely agree with either, for circumstances have very much to do with it, and to say that the Red Squirrels as a whole do not rob bird's nests is a very sweeping statement. There are probably both innocent and guilty ones. In other words, I believe it to be largely a habit, formed like any other habit that an animal may have, or that persons may have.

Yet, with all his many faults and objectionable traits, his intelligence, his wonderful perseverance, his industry, and the cleverness displayed in his various actions cause him to be tolerated, even though he is an acknowledged nuisance. SILAS A. LOTTRIDGE.

EASTERN FLYING SQUIRREL

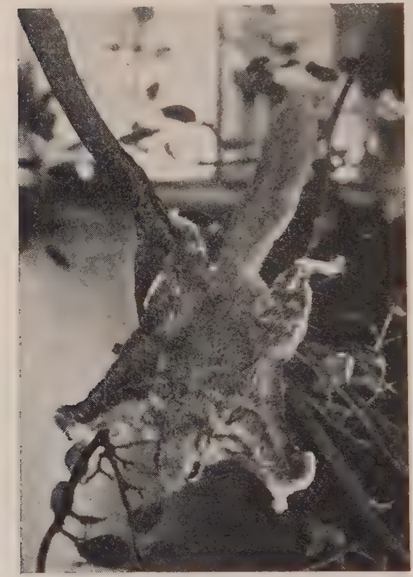
SCIUROPTERUS VOLANS (*Linnæus*)

GENERAL DESCRIPTION.—A small, soft-haired tree Squirrel. Head blunt and rounded; ears low and broad; hair on ears very short; body small; tail about as long as head and body, broad and flat; an extension of skin from the sides of the body reaching from wrist to angle forming, when the legs are spread, a flat plane; legs of moderate length; hair very soft and of moderate length; eyes large and soft; general color above grayish-brown, below white; hairs on tail very soft, and while tail is broad it is not bushy. Nocturnal in habit.

MEASUREMENTS.—Total length, 9.3 inches; tail bone, 4 inches; hind foot, 1.22 inch.

THE Flying Squirrel is a very specialized animal and stands in a group well separated from the other North American Squirrels. Its so-called flying membrane at once marks it out from the other Squirrels, and in addition the texture of the fur is very much softer, the individual hairs being rather long, very lax, and exceedingly soft to the touch. The membrane is supported mainly by the limbs, but in addition a spur, or slender rod, of cartilage runs backward for a short distance from the wrist, and serves to stiffen the forward edge of this gliding plane. A number of Flying Squirrels have been described, some eighteen species and sub-species in all, and while the differences between many of these varieties appear slight, there are several well-marked groups best singled out on the basis of size difference.

The Flying Squirrel is a specialized member of his family, possessing a peculiar, hair-covered membrane of skin on each side of the body, between the fore and hind legs, and attached to both as far as their wrist and the ankle. When the Squirrel is about to "fly," it spreads its "wings," and from the summit of a tree springs into the air and then glides swiftly on an inclined air-plane, always in a slightly descending direction, until a movement, probably of both body and tail, inclines it upward, and it alights gently upon the object for which it set out. The tail, being thin and flat, with closely set silken hairs, probably serves a double purpose on these short "flights"—that of rudder and parachute. I do not mean by this that the tail can in any way turn the animal from a straight line, except that probably by bending it downward, and at the same time elevating the head, it brings the body in a convenient position for alighting upon an upright object. The distance that the Squirrel can "fly" depends entirely upon the elevation from which it starts. The angle of descent is ordinarily from twenty to thirty degrees, although the desire of the animal and the direction and force of the wind probably command an extreme range of from forty to fifty degrees to a nearly perpendicular drop. The powerful hind legs of the Flying Squirrel are important factors at the beginning of the "flight," for by means of these it is projected into the air with considerable force. The usual mode of travel from place to place, if trees are convenient, is sailing from the top of one to the base of another, then running up this and again sailing. It is surprising how quickly one of these little fellows can travel a quarter of a mile.



FLYING SQUIRREL

From a habitat group in the American Museum of Natural History

The Flying Squirrel is one of the most beautiful and graceful, and by far the most gentle of our Squirrels, becoming quite tame in a very few days.

Flying Squirrels make large nests of leaves in tall trees, which are similar to those of the Gray Squirrel. These nests are sufficiently compact to withstand the storms of winter, and warm enough to protect the Squirrels during cold weather. I have never known these nests to contain food for winter use. It may be that they are used principally as summer homes.

The Flying Squirrel during the day avoids the light, its large eyes, like those of the owl, being better adapted to darkness, and so one may get the idea that it is a dull and uninteresting pet, crawling into your sleeve or pocket and seeking any dark place of concealment. When asleep it is so rolled up as to appear like a ball of fur, the head resting near the base of the tail, which is spread over the body, doing duty as pillow and coverlet.

Silas A. Lottridge.

EASTERN CHIPMUNK

TAMIAS STRIATUS (*Linnæus*)

DESCRIPTION.—The Eastern Chipmunk is of small size; head rather rounded; ears short but prominent, clothed with short hairs; body trim but not slender; tail broad and flat, moderately bushy, about half the length of head and body; general coloration rusty-brown above, with five black and two light-colored stripes on back, and with deep chestnut on rump; under parts whitish. An animal of rather active habits.

MEASUREMENTS.—Sexes of equal size. Total length, 9.7 inches; tail bones, 3.7 inches; hind foot, 1.2 inch.

THE Chipmunk may be popularly described as a small edition of the Tree Squirrel. It has much the same shaped head and body, the same bright eye, and the same perky frisk of the tail. In size, however, it is only about one-third the size of its neighbor of the upper stories. It is only about eight or nine inches long, including the long bushy tail; or only five or six inches for the head and body proper.

EASTERN CHIPMUNK

FROM A PHOTOGRAPH BY G. W. STARK

Chipmunks have also been called Rock Squirrels because of their fondness for making a home among rocky crevices. Failing this convenient retreat, they inhabit fence corners or decayed tree trunks that can be entered from the ground.

Since they are too small to attract the attention of the hunters, they have long since ceased to exhibit any lively fear of man. On the contrary, they become easily tamed and may be attracted by any patient passer-by in a woodland, or seen roaming at large in our parks.

Although the Chipmunk ranges over the greater part of North America, there are great tracts of country where it is absent or nearly so. These are the continuous stretches of gloomy forests. A bright, alert, saucy creature itself, it is most at home where it may dart into the sunshine at any moment. The rocky, scrubby, dry pastures of New England are ideal for it, especially when scattered clumps of oak, chestnut, and beech trees are nearby.

The homes of most burrowing animals are advertised by conspicuous earth mounds at the tops or edges of which the burrows open. The Woodchuck and the Prairie Dog are good examples of this. The Chipmunk, however, is wiser. Not only does it not make such mounds, but it takes pains not to make paths leading to the mouth of its burrow. Probably this is done by approaching the burrow from as many different directions as possible, and by moving in long wave-like leaps. The burrow openings, too, are often placed in inconspicuous spots, such as under the edge of a stone, or under a stump or tree root. Considerable cunning is exercised in the making of the Chipmunk's home. The burrow may be started in an open spot and run in various directions with chambers of different sizes, up to a foot in length, placed here and there. Eventually the tunnel has at least two other entrances besides the original one. This is finally closed up, and only hidden openings are left. The burrows are about two inches in diameter, several yards long, and from a foot or less to three or four feet below the ground surface.

If one can think of a Chipmunk with a bad case of mumps, one would have a good conception of that animal with its cheek pouches filled with food. When full these pockets nearly treble the size of the head. As many as four hickory nuts have been found in them. Like a small boy's pockets, these pouches may be filled with all kinds of edibles, especially vegetable matter. Acorns, hickory nuts, beech nuts, and all kinds of seeds and grain form a large part of the vegetable menu; while insects in their various stages, bird's eggs and young, and other freshly killed animals of many kinds find a place in its dietary at times.

August, September, and October are the harvest months for Chipmunks. Then they are very busy gathering seeds and nuts and storing them in underground granaries connected with their burrows. Over half a bushel of such food has been taken from a single chamber, and it is a common thing to find several quarts in one place. Sometimes a few nuts are deposited by digging a slight distance below the ground surface in the same way that Gray Squirrels store food. These, however, seem to be only temporary deposits, which are soon eaten or taken to the main granary. No food of an easily perishable character, like grasshoppers, is stored.

There is considerable difference of opinion in regard to the use of this reserve food. Is it eaten during the long winter months underground, or does the Chipmunk sleep then and use the supply in the early spring when other food is scarce? Unlike many other hibernating animals, the Chipmunk is not particularly fat on retiring to its burrow. It is probable that it eats some of its stores at that time in order to get into good condition for its long sleep, leaving the bulk of it for its spring breakfast. The period of hibernation varies with the latitude. In New York it is from about October first to April first, the length of time depending upon the severity of the season. However, there is evidence that the Chipmunk does not sleep very soundly during hibernation, and that its naps are not long.

The final awakening comes with a rush. When the Chipmunk emerges from its burrow there is no sign of long sleep. Then is the time for love making and for mating. It is probable that Chipmunks pair at least for one season. The four or five blind, naked young are born about a month after the mating of the parents, and may be seen in the upper world in late May or in June, according to latitude. There is some evidence that two litters may be produced in a season.

In addition to its other accomplishments the Chipmunk sings. Those of a given locality will gather and sing their chirping notes for many minutes together, sometimes loud and cheery, sometimes soft and in a conversational tone. From this "chip, chip, chip!" has come the name. With its airy grace, its quick, alert movements, its shiny eyes, its bright coloring and its happy notes, the Chipmunk is the veritable fairy of the mammal world.

Like most rodents, the Chipmunk's enemies are many. All the larger birds of prey find it a choice morsel. Carnivorous mammals get it whenever they can. Badgers will even dig out burrows to get it. The deadliest enemy of them all, however, is the Weasel. Wherever the Chipmunk can go the Weasel can follow, and the only chance of escape left to the pursued animal is to plug up its burrow with dirt.

We should miss the Chipmunk sadly were it exterminated, yet it is necessary to keep the numbers within moderate limits, because of the many young birds which would become its prey, if it were not kept in check. While it does not climb to any extent, it does scent out low-built nests. The damage done to grain in most parts of the country is slight, and is more than repaid by the pleasure of its cheery company.

J. M. JOHNSON.

EASTERN WOODCHUCK

MARMOTA MONAX (*Linnæus*)

OTHER NAMES.—Eastern Marmot; Groundhog.

GENERAL DESCRIPTION.—A large, heavy-bodied, short-tailed ground Squirrel. Nose blunt; head rounded; ears low and rounded; body robust and generally fat; tail short, less than half the length of the head and body, moderately bushy; legs short; hair everywhere rather long and coarse; front feet with four well-developed toes and an incomplete thumb; hind feet with five toes; general color grizzly-brown. Hibernates in winter.

MEASUREMENTS.—Total length, 22 to 25 inches; tail bones, 5 to 6 inches; hind foot, 3.4 to 3.7 inches. Weight about 8 pounds.

EVERY farm boy and girl knows the Woodchuck, for he is as much a part of the farm as the brook or the sugar-bush. In a tramp through the fields almost any time during the spring or summer, one is likely to catch a glimpse of him as he waddles away to his burrow, or possibly to his den in the wall or stone-heap, which he sometimes prefers for a summer home. Those who know him well can easily distinguish his home by the peculiar odor which is always present.

EASTERN WOODCHUCK

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

When our grandfathers were boys the Woodchuck usually had his home in the woods, where he fed on the tender bark and roots of various kinds, but to-day we find him more inclined to the fields, near the farmer's clover-patch. There is a touch of laziness in his disposition, and probably he finds the clover-patch an easier place to get his living. Then, too, it is nearer the garden where he can occasionally taste the juicy peas, beans, and lettuce, of which he is very fond. But he has greatly added to his danger by this change, for here the farmer continually wages warfare against him from early spring until fall. Many are trapped, some are shot, and others are killed by farm dogs.

Trapping is easier in May or June than later in the summer, when experience has made them wise and timid. Sometimes, leading from the burrow is a well-defined path through the grass, and in this the trap is set, but usually it is placed at the entrance of the burrow and made fast to a stake which is driven into the ground. Old Woodchucks at last become very shy and develop great skill in detecting and avoiding the dangers of the traps. Sometimes one of them will spring a trap day after day without being caught.

After the grass has been mowed in the meadows and he can no longer hide himself, the Woodchuck becomes still more shy, for he must now look out for the farmer and also the village sportsmen, who often betake themselves to the country on leisure afternoons to indulge in Woodchuck hunting. Then, too, he must reckon with the farm dog, which frequently develops great ability in nosing him out.

The real home of the Woodchuck is the tunnel or burrow in the ground, which varies in length from ten to twenty-five feet, and is two or three feet below the surface. The entrance to the burrow slants sharply down and then up to the general level, which secures better drainage. The Woodchuck is somewhat of an engineer, though not so good as the Beaver, and realizing the importance of drainage, most frequently chooses the hill-slope site. The main burrow ends in a chamber of sufficient size for the occupants to turn around comfortably. There may be one or more side tunnels, varying in length from three to five feet. Frequently at the end of one of these is an observation outlet, which also may be used in times of invasion by other animals, such as the Fox, Mink, or Skunk.

Usually each young Woodchuck has a burrow by itself, but sometimes a pair will live together during the winter. From October to March, in general, the Woodchuck is said to "hole up" or "den." This means passing the dreary winter months of sleet and snow in the deep sleep called hibernation.

The Woodchuck is the only animal that has been honored by a special day on our calendar. "Groundhog Day" (February 2) is so called because of the popular belief that, on this day, the animal takes its first weather observation after its long winter sleep. If it sees its shadow (that is, if the sun is shining), back it pops into its hole, and we are in for six weeks more of winter. SILAS A. LOTTRIDGE.

Hoary Marmot

Marmota caligata (*Eschscholtz*)

Other Names.—Gray Marmot, Whistling Marmot.

General Description.—Much larger than the Eastern Marmot, or Woodchuck, but with the same general build and habits. General color much lighter than Eastern type.

Measurements.—Total length, 29 inches; tail bones, 7 inches. Weight, 10 pounds.

The Hoary Marmot and its Western cousins are in general considerably larger than the Eastern Woodchuck, but can be readily recognized even by the casual passerby as near relatives of that familiar animal. In colors the western members range from the grizzled gray of the Hoary Marmot, which ranges the Canadian Barren Grounds, to the Yellow-bellied Marmot of the Southwest, a beautifully marked animal that can be readily distinguished by the golden hue of its under fur. Here once again we see the protective coloring afforded by nature. In the northern wastes the animal is given the indiscriminate gray which blends so perfectly with the landscape; while in the southern deserts it reflects the hues of sand and rocks.

The general habits resemble those of the Eastern type, with such changes as may be made necessary by locality. For example, in the far North the period of hibernation is very long, because of the length of the winter; while in the southern deserts it is doubtful if the Marmot hibernates at all. A noteworthy feature about the whole tribe is their ready adaptability to almost any climate. They seem to thrive almost equally well in southern climes, and in frozen wastes as high as latitude 63°. They are found on the deserts and also on the very tops of mountain peaks. Says Merritt Cary: "The Marmot is one of the most characteristic mammals of the mountains, and occurs from 6,000 feet in the foothills to the rocky summits of the highest peaks, at over 14,000 feet. It has, therefore, a vertical range of about 8,000 feet. Marmots are much more abundant above than below 8,000 feet, and are especially numerous in the slide rock near timberline. They are reported present on the summit of Gray's Peak, at an elevation of 14,341 feet, and have been observed also on the summit of Long's Peak, 100 feet lower. The clear, shrill whistle of the Marmot is one of the few sounds that break the silence of the high altitudes, and the large reddish-brown animals may often be seen sunning themselves on the warm, flat surface of rocks during the middle of the day. In the Hahn's Peak region Marmots are abundant, and are usually seen around abandoned prospect holes and mining shafts."

The Hoary Marmot is also called the Whistler, from its call—a shrill whistle used not only as a danger signal but as a means of communication at all times. It seems, in fact, quite proud of its vocal efforts, and its pleasant call has cheered many a lonely traveler.

Prairie Dog

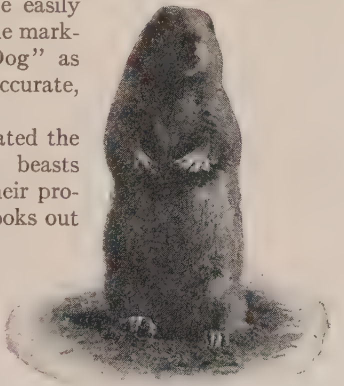
Cynomys ludovicianus (*Ord*)

General Description.—A stout-bodied ground Squirrel of the Plains regions. Head blunt, rounded; ears low and broad; body thick-set; tail very short, about one-third length of head and body, slightly bushy; legs short; claws long; general color, reddish-brown grizzled with grayish above; beneath, yellowish-white; hairs fairly long and coarse. Lives in colonies.

Measurements.—Total length, 14 inches; tail bones, 3 inches; hind foot, 2.3 inches.

The Prairie Dog lives upon and just under the surface of the ground. It is not a climbing animal, but devotes its surplus energies to burrowing. It is of social disposition and is always to be found in colonies, often of large size. It is related, on the one hand, to the Spermophile, and, on the other, to the Marmot, but may be easily distinguished from either of these by the markings outlined above. The name "Dog" as applied to this animal is, of course, inaccurate, as it is a true rodent.

Ever since the first explorers penetrated the Western plains, these sociable little beasts have been known and liked, despite their propensity for mischief. To-day as one looks out of the car window, he will be rewarded by seeing a little inquisitive head pop out of a hole, or a sentinel-like animal sitting gravely at his threshold as though monarch of all he surveyed.



PRAIRIE DOG
From a photograph by P. C. Kangieser

Prairie Dogs are easily introduced into almost any open country where the ground is dry, but they are very difficult to exterminate. They breed readily in captivity and usually produce four young at a birth. In 1899, says Dr. Hornaday, a free colony was established in the New York Zoölogical Park in the Antelope Range, where it existed for two years, and its saucy members attracted far more attention than those confined in the fenced village. Knowing that guns and dogs were not allowed in the Park, they often permitted visitors to pass within six feet of them. But it proved impossible to keep those industrious diggers from spreading far beyond the limits fixed for them, and seriously damaging walks and lawns, so they were finally caught by placing sand in boxes over their burrows, and transferred to the village whose walls of solid masonry go down to bed rock.

The Prairie Dog flourishes over a wide extent of western country, from Texas, New Mexico, and Arizona northward to the Canadian boundary. It is also at home on the western slope of the Rocky Mountains in Utah and Colorado, and is most abundant in Montana, Wyoming, and western Kansas. One of the largest Prairie Dog towns yet reported begins in Trego County, Kansas, and extends along the divide north of the Smoky Hill River, practically without a break, to Colorado, a total distance of about 100 miles. This town varies in width from half a mile to five miles, and on the top of the divide the nearest water is 350 feet below the surface.

In a "Yearbook of the Department of Agriculture," Dr. C. Hart Merriam, writing on "The Prairie Dog of the Great Plains," tells us:

"The holes go down for some distance at a very steep angle and then turn at nearly a right angle and continue horizontally, rising somewhat toward the end. The nests are inside the chambers connecting with the horizontal part of the burrow, and usually, if not always, at a somewhat higher level.

"The Prairie Dog has several natural enemies which, when not interfered with by man, usually serve to hold its members in check. The most inveterate of these appear to be the coyote, badger, ferret, and rattlesnake."

THE BEAVER FAMILY

(*Castoridæ*)

BEAVERS have been placed in a family by themselves, because of certain well-known features which distinguish them. Not only are their outward habits peculiar, but their anatomical markings are distinct. Rodents of this type are characterized by a massive skull. The cheek teeth are rootless, and on each side there is one premolar above and one below. The tail is broad and shaped like a spatula, and the hind feet webbed, to assist in swimming. Beavers are aquatic in their habits, and generally build their homes in the dams which they themselves have constructed. In this and in other work they display engineering skill of a high order. Economically also they are important. A very valuable trade in Beaver skins was carried on during the early days of this country, which continued until the animals became comparatively scarce.

BEAVER

CASTOR CANADENSIS (*Kuhl*)

GENERAL DESCRIPTION.—Much the largest of American rodents, weighing up to 50 pounds. Head broad and rounded; nose blunt; incisors prominent and of a deep orange color; ears quite short and not projecting much above long hair of head; body very thick-set and heavy; tail broad and spatulate, flattened horizontally, and about one-half length of head and body; legs short; toes, five on each foot; hind feet webbed and with claw of second toe doubled or divided; musk secreting anal glands; general color dark chestnut; paler below; coat composed of dense short under fur and sparser outer fur of longer, harder hairs. Aquatic in habit.

MEASUREMENTS.—Total length about 42 inches; tail, 16 inches long by 4.5 inches wide; hind foot, 7 inches.

IN the days of the early settlement of America the Beaver, including its races, was found from the Atlantic to the Pacific, and from the limit of trees in the far north of Canada to the Gulf of Mexico, wherever conditions were favorable. To-day, however, thanks to the unstinted greed of man, this harmless animal has disappeared from the greater part of its former range, and over much of the remainder it is rare.

Within the last fifty years nature lovers and the better class of sportsmen have realized the great loss to the country which would result from the extinction of this valuable animal, and have succeeded in having it protected in many States. The result is that it has become abundant in certain regions and is common in others. This is notably true in Colorado and Wyoming. In Maine and in the Adirondacks of New York State it is increasing rapidly. In Estes Park, Colorado, it is especially numerous, one holding of 1,000 acres having a population of 600 or more.

With proper protection and well enforced laws regulating its capture, there is no reason why the Beaver should not become again a source of pleasure and of profit over much of its early range.

Excepting Rats, Mice, and Rabbits, probably no rodent is so well known. The Beaver's industry has become proverbial; his fur is familiar to all, and his habits have made him a subject of much interesting literature.

The broad tail is not used as a trowel, as was formerly supposed, but as a rudder. Mr. Enos A. Mills states that sometimes mud is transported by being held between the tail, which is turned under and forward, and the under side of the body.

In these days of animal persecution the Beaver is nocturnal, but in localities where he is thoroughly protected he may be seen at almost any time during the day, particularly toward late afternoon.

No mammal approaches the Beaver in the extent or the variety of the structures which it makes. He is the engineer of the mammal world. These works not only involve highly developed instincts, but, some writers believe, indicate a great degree of adaptive intelligence. Certain it is that the Beaver seems to use reason in modifying his structures to meet new situations.

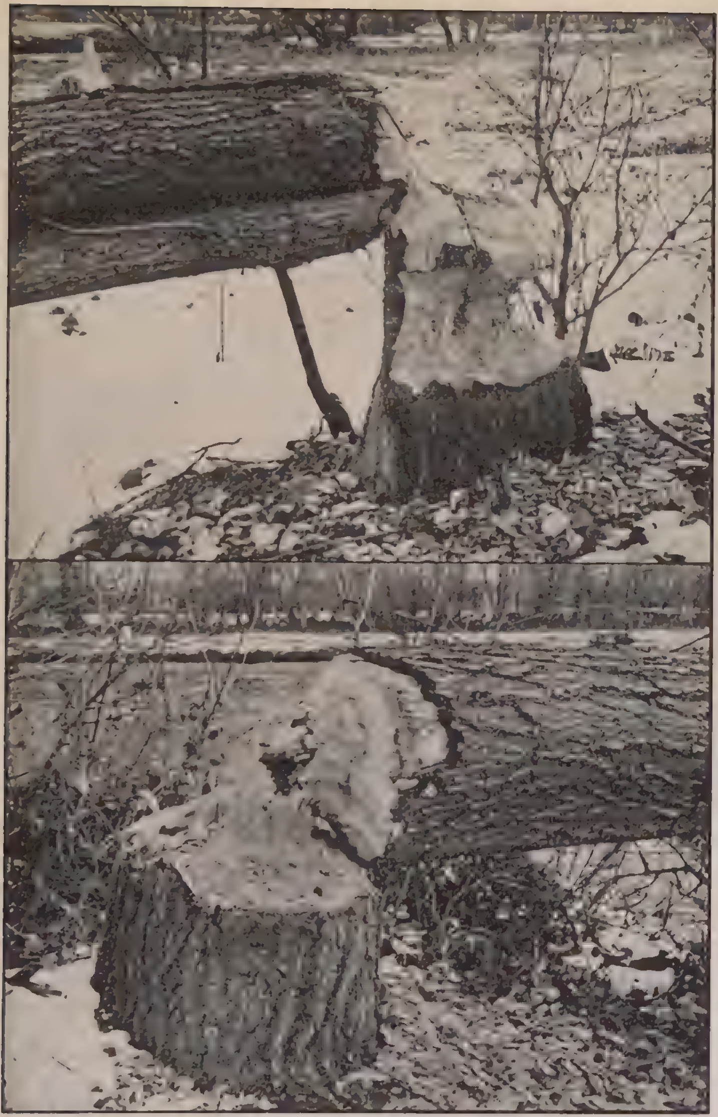
Of all the Beaver's works his dam has attracted the most attention. A fairly narrow valley is selected through which flows a small stream with a slowly moving current. Across this a dam is made of sticks, stones, mud, and rubbish. The dam is usually from four to six feet high, eight to sixteen feet broad at the base and a foot or two wide at the top. The length may vary from a few feet to several hundred. Secondary dams are often built below the first. These are apparently for the sole purpose of backing up the water against the first dam, and so relieving the pressure—an astonishing proof of the animal's intelligence.

In making the dam mud is used, reinforced by sticks from four to twenty feet long, and from two to six inches in diameter. These are laid approximately parallel to the stream flow, with the larger ends upstream. They are held in place by piling mud and stones on these ends. More sticks are piled above the first, and so on until the required height is reached. The mud is taken from in front of the dam and deepens the water at that point. Sometimes simply a barrier of sticks is made through which the water passes freely. In the course of time, however, floating material lodges against the sticks and completes the dam.

As time goes on the sticks decay; more and more mud is added by the Beaver; grass, willows, and alders get a strong foothold, and we have a solid structure of earth and rocks held firmly together by vegetation. Strong as they are these dams are often broken by flooded streams, but are quickly repaired by the ever-watchful builders.

Structures which cost so much work as these must be of much value to the Beaver. Two purposes are fulfilled. Usually the dam forms a pond deep enough so that the openings into the Beaver houses, or into burrows in the bank, are far enough under water to protect their owners against enemies. The center of the pond provides a storage place for the large supply of green sticks collected for the winter food. A third use is to extend a body of water toward a group of trees which the animals are to cut and float to their homes.

As has been indicated, Beavers live in houses or in holes in the banks of ponds. The houses are made of much the same material as the dams,



TREES CUT BY BEAVERS IN THE MOUNTAINS OF COLORADO and are of various sizes according to the number of individuals living in them. They are conical, and may be eight feet high by forty feet in circumference. Inside, and just above the water level, is a large chamber which is connected with the outside by a tunnel opening under water. The chamber walls are about one foot thick and, when frozen solid, defy the attacks of the Beaver's fiercest enemy, be it Bear or Wolverene.

When the home is a burrow, the opening is under water and a tunnel extends diagonally for several feet, sometimes thirty, into the bank, and ends in a chamber three or more feet in diameter and about one foot high.

In summer Beavers travel away from home to a considerable distance, visiting other colonies and exploring other streams, and the houses are used less and the burrows more. When harassed they are less likely to make houses.

Of all the works which show the skill of the Beaver, many regard his canals as showing his intelligence to the fullest extent. Many animals build homes, and the dam has a direct connection with the safety of the Beaver home, but the canal has no direct connection with either. It is a structure planned with a definite end in view, that is, the greater ease in transporting food. When all suitable trees near the borders of the pond have been cut, it becomes increasingly difficult to get sticks from the source of supply to the storage pile in the home pond. At the expenditure of much energy the stick must be rolled, pushed and dragged for a distance, in some cases, of a quarter of a mile or more. To avoid this, when the ground is suitable, a colony of Beavers will often dig a canal in the direction of a grove of trees. According to circumstances such a canal may be from a few feet to several hundred in length. Its depth varies from about fourteen inches to over three feet, and its width is two feet or slightly more. Beavers will on occasion dam the canals and also construct lateral ridges to direct surface water. This further evidence of engineering skill would be astonishing were it the only trait of this extraordinary animal.

Canals are sometimes dug in the bottoms of shallow ponds. These make travel and transportation easier in times of low water, and afford avenues of travel when the ponds are frozen nearly or quite to their bottoms.

The food of the Beaver has been indicated already. It is the bark of many kinds of deciduous trees, especially aspen, willow, and birch. Roots of water-lilies, grasses and even berries are also eaten, but bark is the staple. Evergreen trees are sometimes cut for structural purposes, but the bark is not eaten.

Since the Beaver cannot climb, he must fell trees in order to get any large supply of food without traveling to great distances. This he does by gnawing, for which his four great chisel-shaped front teeth are well adapted. A tree two to eight inches in diameter is usually selected. The worker sits bolt upright with his tail stretched out behind, as a prop, and proceeds to cut in such a manner that, just before the tree falls, the cutting resembles the central part of an hour-glass. When once seen it can never be mistaken. As the tree is about to fall the Beaver wood-chopper slaps the ground with his tail as a warning to others, and all get to places of safety. The branches are trimmed off next, the trunk cut into lengths of from three to six feet or more, and are dragged and rolled to the pond or canal through which they are floated to the food pile near the house. Here they are sunk to the bottom and held there by a little mud and by other pieces piled on top. The diameter of the trees cut usually is not over eight inches, and the record is thirty inches, but the writer has seen three narrow-leaved cottonwood trees in one group, varying from twelve to fourteen inches in diameter, all of which had been felled. Only branches less than eight inches in diameter, however, had been used.

The Beaver, contrary to common report, does not always succeed in making a tree fall in a given direction. Many pictures are extant showing trees in helter-skelter position.

After the bark has been eaten during the winter the sticks are used for house and dam building, if needed.

Beavers should be allowed to exist simply for the interest they add to the life of mankind, to say nothing of their economic value. Beaver skin has brought more money than that of any other animal, unless it be the Fur Seal. So common was its fur in early days, and such a standard value did it have, that in Canada for many decades it was a medium of exchange among the Indians, white trappers, and traders. In the latter part of the eighteenth century American companies exported about 150,000 skins annually, and the Hudson's Bay Company 50,000 more. The fortune of the Astor family had as its basis chiefly the trade in Beaver fur. This interesting fact is tacitly implied in the image of the Beaver which appears in the tile work of the subway station at Astor Place, New York.

J. M. JOHNSON.

"We shall be so kind in the afterwhile,
But what have we been to-day?"

THE PORCUPINE FAMILY

(*Erethizontiidæ*)

THE Porcupines belong to a separate family from the other North American Rodents—their outward dress alone serving to distinguish them from other animals, were there no other marks. They are thick-set Rodents, having long sharp spines loosely attached to the skin. The skull has a short, blunt, facial portion. The molars are more or less completely rooted.

The short thick tail, short legs, and plantigrade feet are also characteristic of our native species, although foreign types differ, one kind in South America having a long tail for clinging like our Opossum. Spines, which are barbed at the tip, are scattered among the hair, pointing backward, but may be elevated by a contraction of the muscles. They are so loosely set that they readily stick to other objects, such as the mouth of a hunting animal, but the Porcupine has no power to discharge them.

CANADA PORCUPINE

ERETHIZON DORSATUM (*Linnæus*)

OTHER NAME.—Quill Pig.

GENERAL DESCRIPTION.—A very large rodent with thick-set body and coat containing numerous sharp barbed spines. Exceeded in size among American rodents only by the Beaver. Head blunt and rounded; facial region short; ears of moderate height; body very stout and thick-set; tail about one-fifth length of head and body, thick and muscular; legs short; four toes on fore feet, five on hind feet; lips hairy; coat composed of three elements, a short, fairly soft under fur, very long, coarse hair forming the outer fur, and numerous stout spines set loosely in skin and barbed at tips. These spines have lost all resemblance to hairs. Coloration dark.

MEASUREMENTS.—Total length, 35 inches; tail, 5.5 to 6.5 inches; hind foot, 3.5 inches. Weight, 30 pounds.

ANYONE who has traveled in the woods of the northern United States is familiar with the Porcupine, or Quill Pig. In appearance he is not attractive. His shape is not unlike that of a Beaver, covered with long stiff quills. His tail, too, is broad and flat, but not so wide as that of a Beaver. This also is quill-covered. The dull expression of his eyes is indicative of a thoroughly stupid animal.

As in the case of so many animals, the Porcupine is more common in some localities now than it was some years ago. In the Adirondacks when deer were formerly hunted with hounds the latter would often attack a Porcupine. A mouthful of quills and a dog rendered useless for a long time was the result. The hunters swore vengeance on the cause of their troubles, and shot every Quill Pig they saw. In Canada the Indians also decreased their numbers by killing them for food. Now all is changed. A law protects them in Canada, and hounding deer is not allowed in most parts of the United States. The hunters also fear to frighten the deer by shooting at other animals, and thus the Porcupine escapes.

CANADIAN PORCUPINES

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

Although found in deciduous and in mixed forests, the Porcupine prefers the evergreen woods. The hemlock is his favorite food tree, and, in winter, he subsists almost entirely upon the bark of this and other trees.

In summer, however, he will eat almost any vegetable matter, and will go to considerable trouble to get lily-pads.

In one respect, however, the Porcupine is not a strict vegetarian. He will brave all dangers to get salt, or anything that has the suggestion of a salty flavor. Repeatedly during the night he will return to a camp from which he has been driven, in order to gnaw flooring, door jams, ax-handles, or any article which has been handled.

Except during the coldest weather, the Porcupine does not hibernate. He may stay in his "den" until the worst is over, but a slight increase in temperature will bring him out, and his wanderings may be traced by his tracks in the snow and by chips and pieces of bark under the trees where he has fed. Nor does he confine himself to the night hours for roaming, but may be seen at all hours of the day. Once he has gotten into a favorite tree, he is not likely to leave it until he has exhausted its food possibilities.

Although a Porcupine will retreat when it can, it will often sit still, if its place of refuge is too far away. When attacked it does not roll itself into a ball, as has often been stated. It does, however, arch the back, erect the quills, put the head under a log or root, if one happens to be handy; otherwise it puts its nose between its forepaws. Then if approached closely, or poked with a stick, it waves its tail defiantly. Woe betide the animal which is rash enough to get in the way of that tail. Wherever it strikes flesh the quills penetrate, stick, and cause great pain. More pain will come later when an attempt is made to pull the quills out. The point is very sharp, and below it are hundreds of little barbs pointing backward. This means that they must often be cut out of the flesh or the points broken off in it. In the latter case these points often "work through" the part injured. The quills separate easily from the skin of their owner, but he *cannot throw them* at an enemy as was formerly stated.

Panthers, lynxes, bears, foxes, wolves, and other flesh-eaters fall victims in their attempts to make a meal of this armored rodent. The mouth and throat of these victims become so sore and swollen from the quills that the animal cannot eat, and soon perishes. The fisher is believed to be the only enemy that has solved the problem of safe attacks. It kills the Porcupine by quickly turning it over and slitting its abdomen.

Since the Porcupine does not have to depend upon flight, alertness, subterfuge, or fight to escape its enemies, but only upon a protective covering, its mental qualities are not high. Indeed, it is one of the dullest animals. Use is the mother of progressive development, and disuse leads to degeneration.

Mating in the northeastern United States takes place in the autumn, and the young are born about the first of May. Merriam states that they are actually larger, and relatively thirty times larger, than the young of the Black Bear. From one to four is the number in a litter. By autumn they are able to shift for themselves.

The *Yellow-haired*, or *Western*, *Porcupine* is so much like the eastern one in general appearance that a casual observer would not see any difference. He has the same spiny covering, the same stupid eyes, and the same indifferent attitude toward his enemies. The chief difference is in color, the western type being of a greenish-yellow hue.

The Indians value the Porcupine as a food and as a source of the quills which the women use for various kinds of fancy work. The white man, however, has made little use of this peculiar animal. It has, however, saved the life of more than one hungry man lost in the wilds, as it is the only edible animal that can easily be killed without firearms.

J. M. JOHNSON.

THE FAMILY OF RATS AND MICE

(*Muridæ*)

THIS is the largest of all families among the mammals. It numbers a wide variety of individuals. They are generally very small rodents with lower incisors compressed; no premolars; molars rooted or rootless; and tail generally nearly naked and scaly.

Dr. Coues described the members of this family as "a feeble folk, comparatively insignificant in size and strength, holding their own in legions against a host of natural enemies, rapacious beasts and birds."

Few of us have any idea of the large number of these little beasts. They are found almost all over the world, far outranking other forms in number. In North America nearly one-fourth of all our four-footed animals belong to this mighty family. There is, in fact, no escaping them. They invade our pantries, our barns, our fields, our plains, and our woodlands.

There are special types adapted to nearly every environment, as for example the Wharf and Sea-going Rats.

The family is therefore of great economic importance to man and its members—some of them at least—may be fittingly described as the greatest travelers among mammals. Probably not a ship enters or leaves our ports that does not have among its unlisted passengers some enterprising Rat or Mouse. Dr. Rae some years ago captured at York Factory, on Hudson Bay, a specimen of the Common House Mouse which had been brought from Europe; and the Brown Rat has been seen on liners between San Francisco and Honolulu.

In size the numerous species comprising the family range from the Muskrat to the pigmy Harvest Mouse. Every country has its own particular species, and North America has many that are native. The fecundity of Rats is astonishing. In the temperate parts of the United States, Rats breed three to five times a year; the Meadow Mouse brings forth four to six litters. That Rats carry disease from place to place and disseminate it, has been established beyond question. Not only do they convey the bubonic plague, but they are known to spread trichinosis among swine. As they move about in all sorts of filth, it is probable that they must be active agents in the spreading of the germs of other diseases. The Brown Rat, the Roof Rat, and the Black Rat are, however, all "introduced" Rats. The native American Rats are of a totally different character. Rats like the Wood Rat are not only clean in themselves, but their food is of an unobjectionable nature; and, as will be shown later, their flesh is both wholesome and palatable.

In habits Rats and Mice are for the most part nocturnal. Many species live in burrows or tunnel-like runways on the surface of the ground among the grass roots and seldom venture forth into the light. Other species like the Muskrat are aquatic and have become excellent swimmers. While this family is popularly known as Rats and Mice, the two names refer to the same type of animal, the distinction being chiefly one of size. As the sizes approach each other, there is some confusion of terms, which is further heightened by the use of such terms as Lemming, Lemming Mouse, and Vole. However, by dividing the present numerous family into fairly well-defined groups, we shall be aided in our study of these industrious and ubiquitous rodents.

House Rat

Epimys norvegicus (*Erxleben*)

Other Names.—Norway Rat, Brown Rat, Gray Rat, Barn Rat, Wharf Rat.

General Description.—The common Rat to be seen about cities. Head of normal size; nose pointed; muzzle naked at extremity; ears and eyes rather large; body moderately large; tail long, about half of total length, nearly naked, with rings overlapping scales; legs of normal proportions; hind foot with six tubercles on the naked sole; no cheek pouches; fur rather coarse than soft.

Measurements.—Total length, 15.7 inches; tail bones, 7.5 inches; hind foot, 1.6 inch.

The common Rat is an introduced guest, as its other name, "Norway," indicates, and has somewhat overstayed its welcome. Evidence shows that it reached our shores both by way of the Atlantic and the Pacific.

There are three related species that have been thus introduced. One of the first to come was the Black Rat, and also, at an early time, the Roof Rat. However, with the advent of the Norway Rat, both the others were driven out, and to-day are found only in out-of-the-way places not yet settled by the Norway Rat.

Courtesy of West Virginia Experimental Station

HOUSE RATS

These introduced Rats may be readily told from our native Rats by their general appearance, such as the scaly, ringed tail and the coloration above described.

The Norway Rat is perhaps the most detested of all mammals. It is a born thief; it feeds on nearly every kind of vegetable or animal food. It will kill poultry and devour eggs; it will ravage grain fields and carry off to its hole grain, potatoes, vegetables, and similar spoil. Its powerful teeth enable it to gnaw through stout boards and partitions in a very short time.

The peculiarity of this Rat is that it is destructive everywhere. In the fields it digs the seed as soon as it is sown; it eats the green growing grain; and when the crop is harvested it follows it into the stack, the granary, the warehouse, and the mill. In the greenhouse it attacks the bulbs, stems, leaves, and seeds of flowers; it will climb blackberry canes and grape-vines to obtain the fruit; and in imperfectly protected henhouses it will take both eggs and young chicks from under sitting hens. Many of these depredations are not prompted by need of food.

The Black Rat seems to have been the first of the foreign Rats to take up its abode among us. Of Oriental origin, it made its way into Europe and was thence conveyed to Spanish America, probably in the sixteenth century. It spread northward; but with the introduction of the Norway Rat, the black species was gradually driven out by its more savage relative.

The Roof Rat originally came from Alexandria, Egypt, or the neighboring countries. It resembles the Brown Rat, but is grayer in the upper parts, and its abdomen and feet are of a yellowish-white.

Albert Porter.

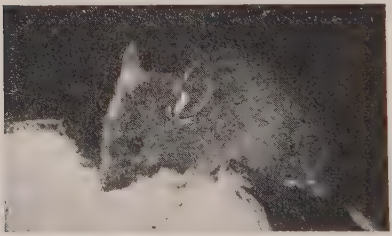
House Mouse

Mus musculus *Linnæus*

General Description.—The common Mouse found about dwellings. Nose pointed; ears fairly large; body neither thick-set nor slender; tail quite long, longer than head and body; legs fairly long; color above, yellowish-brown; hair fairly soft.

Measurements.—Total length, 6.3 inches; tail bones, 3.2 inches; hind foot, .7 inch; ear from notch, .6 inch.

The House Mouse, like the poor, we have always with us. It is the most democratic as well as the most familiar of all our mammals, making its home with equal readiness in the lowly East Side tenement and the palatial Fifth Avenue mansion. No part of a house is sacred to it; no article of furniture, however costly, if suitable in shape and favorably placed, is too good to serve as its nest; no dish of flesh, fish, or fowl is either too coarse or too delicate for its palate.



HOUSE MOUSE

Not every mouse found in the house, however, is the common House Mouse. Field Mice often gain entry to houses and establish themselves in a very short space of time.

On the other hand, House Mice in choosing their dwelling-places do not always confine themselves to houses. Mr. Vernon Bailey, when making a biological survey of Texas, a few years ago, found that they were "by no means confined to houses and outbuildings, but over much of the country had become established in the fields, meadows, hedgerows, and weed patches, from which they collect in the stacks of hay and grain, and are ready to attack each crop as it matures."

The appearance and habits of this little rodent are well known. House Mice are very prolific, and soon become a nuisance, if not checked. They begin to breed when three months old, and have litters at intervals of eight or ten weeks all the year round. There are usually five to ten young at a birth. ALBERT PORTER.

EASTERN WHITE-FOOTED MOUSE

PEROMYSCUS MANICULATUS (*Wagner*)

OTHER NAMES.—Deer Mouse, Wood Mouse.

GENERAL DESCRIPTION.—A medium-sized Mouse of normal proportions, slightly larger than the common House Mouse. Nose pointed; head of moderate proportions; ears large, prominent, covered with very short hair; eyes large; whiskers prominent; body medium; tail long, about length of head and body, and well clothed with short hair; limbs slender and of moderate length; general color above, yellowish-brown; below, clear white; hair of moderate length and quite soft.

MEASUREMENTS.—Total length, 6.5 inches; tail bones, 3 inches; hind foot, .8 inch.

THE White-footed Mouse is by far the most beautiful species of the family to which it belongs. Indeed, it is almost a shame to call this handsome creature a mouse at all! He is almost a dandy in dress and neatness, and his spotless robe of grayish fawn above is sharply contrasted with the pure white beneath. This, coupled with the natural grace and agility of his movements, distinguishes the White-footed Mouse as one of our most attractive little mammals.

Courtesy of West Virginia Experimental Station

WHITE-FOOTED MOUSE FEEDING ON A NUT

Combined with this grace and beauty there is a gentleness of disposition reminding one of the Flying Squirrel. It is said that these two little wood-dwellers are sometimes found living in the same cavity. An adult White-footed Mouse, when captured wild, will seldom bite if taken in the hand, and after two or three days of confinement is as gentle and confiding as though it had been born in captivity.

The home of the White-footed Mouse is occasionally found in deep forests of evergreens or deciduous trees; but its usual abode is along hedgerows, in the fields, or even in dwellings about well-wooded sections of the country. The hunter's camp is very sure to be visited by them, and sometimes their friendliness becomes a burden. While their usual food is nuts and seeds of various kinds, they soon learn to eat almost anything about the camp. These little fellows show a most surprising capacity for food, and when once a hungry horde of them takes possession of the camp, well may the hunters and trappers look carefully after their stock of provisions; for when the snow lies deep through the forest and the nearest store is forty miles away, then every ounce of flour and meal is precious.

The White-footed Mouse, like some of the Squirrels, constructs an outside nest in thick tangles of bushes from four to ten feet above the ground. The favorite location seems to be about some gently inclined vine, such as the wild grape, which affords a natural and easy highway from the ground to the home of the wee architect. The nests are slightly globular in shape, and composed of dried leaves, grasses, moss, and fibrous barks of various kinds, the material being closely compacted and the general appearance very pleasing. The entrance is usually on the lower side. Sometimes the foundation is an old bird's nest. I once found a nest that was fifteen inches in length and about eight inches in diameter, this being the largest one I ever saw. SILAS A. LOTTRIDGE.

COMMON MEADOW MOUSE

MICROTUS PENNSYLVANICUS (*Ord*)

OTHER NAMES.—Eastern Vole, Field Vole, Field Mouse.

GENERAL DESCRIPTION.—A medium-sized Mouse, short-tailed, with body rather heavier than that of the common House Mouse. Head large and blunt; ears low and almost hidden in the fur; body thick-set; tail short, about twice as long as hind foot; fur long, overlaid with coarse hairs; legs short; soles of feet naked and having six plantar tubercles; molar teeth with a great number of sharp angles in the enamel, thus furnishing many sharp cutting edges; mammæ eight; general color dusky gray or brownish.

MEASUREMENTS.—Total length, 6.7 inches; tail bones, nearly 2 inches; hind foot, .8 inch.

THE Meadow Mice are probably the most abundant small rodents in North America, not only as regards individuals, but also as regards number of species. There are no less than seventy-six species and subspecies north of the Rio Grande, not to mention a few that are found south of this boundary. This large number of different varieties is due to the great diversity of local surroundings in which the Meadow Mice live. Being of a vigorous stock, they have pushed into almost every available economic niche.

In fact, the most remarkable thing about these troublesome little rodents, the Field Mice, as the farmers generally call them, is their ability to adapt themselves to the most widely differing environments. No matter whether above the timber line on some snowclad Alaskan peak, or in the pine forests of Georgia; whether on the arid sand flats of the Painted Desert, or in the well-watered meadows of Pennsylvania—everywhere they seem to enjoy life. Under one set of conditions as under another, they present an equally sleek and well-fed appearance. Naturally the effect of environment is seen in the peculiarities of certain species, as the brightening in color due to the effect of red soil.

MEADOW MOUSE

From a habitat group in the American Museum of Natural History

"The vast range of this species has been noted," says David E. Lantz in "An Economic Study of Field Mice."

"In swamps Meadow Mice nest in burrows in dry tussocks or in bunches of grass above the surface of the moist ground. The nests are composed of grass or fibers of weeds made into balls, loose and of coarser materials outside, but compact and of finer stuff within, each having a small opening on the side near the bottom. From this opening two or more trails diverge, one usually leading into an underground tunnel which opens at some distance from the nest. Nests intended to receive the young are lined with the softest of accessible materials.

"The Meadow Mouse never lives in barns or outbuildings. Its nearest approach to human habitations is the stackyard or piles of wood or boards left on the edge of orchards or fields near houses. It is especially noted for long winter excursions from its summer abode, hiding its movements under cover of deep snow. The journeys of the animals are not suspected until the snow disappears, when the trails can be traced to great distances. They reach wheat, rye, clover and timothy fields and often extend into orchards, nurseries, lawns and gardens, all of which are injured by the animals."

MUSKRAT

ONDATRA (OR FIBER) ZIBETHICA (*Linnæus*)

OTHER NAME.—Musquash.

GENERAL DESCRIPTION.—A large rat like rodent with long, naked tail, flattened from side to side. Head broad and blunt; ears almost hidden in long fur; body thick-set, heavy; tail long, about one half total length; legs short; hind feet specialized, long, with toes partly webbed; tail much deeper than wide, almost naked and scaly, with scattered long hairs; fur of two coats, a dense soft under fur and long outer coat of hard glistening hairs.

MEASUREMENTS.—Total length, 21 inches; tail bones, 10 inches; hind foot, 3.5 inches. Weight, 2 pounds 4 ounces.

IN general structure and in the character of the teeth, the Muskrat is simply a great Mouse; but in shape and habits it is a small edition of the Beaver. In fact, Linnæus put it into the same family genus with the latter. However, it is much smaller than the Beaver, and the tail is entirely different, that of the Beaver being very broad and flattened laterally, while that of the Muskrat is narrow and flattened vertically. This flattening enables the Muskrat to use it both as a rudder and propeller. The hind feet are slightly webbed and assist in swimming.

Courtesy of New York Zoological Society

MUSKRAT

Anyone who has visited marshy ponds and sluggish shallow streams has noticed the conical piles of mud and vegetable matter which extend from a foot to three feet above the surface of the water. These are Muskrat houses, similar to, but smaller than, Beaver houses. The method of building these is rather unusual. A pile of mud mixed with plant stalks is brought together in a place where the water is about two feet deep. When the pile is sufficiently large, the Muskrat makes a tunnel from the bottom upward, and hollows out a chamber just below the upper surface of the dome, or through it in some cases, so that only a few plant stalks stick out above. More mud and stalks are placed on top of the chamber, as the roof sinks, until the whole house is firm. The single main room may be a foot or more in diameter and sufficiently high to enable the owners to move about freely. Sometimes there are two main chambers, each with its own entrance, but they are probably occupied by different families. These houses are chiefly used in winter. Work of repairing old houses and erecting new ones begins in early summer, in order that they may be snug and shipshape when ice begins to form.

In summer an elaborate system of tunnels and chambers is used for refuge and for breeding. The mouths of these tunnels start well under the surface of the water and lead upward gradually to the chambers above water level, and often beneath the roots of trees. Small ventilation holes connect these rooms with the ground surface. Sometimes channels extend from the burrow entrance out into the deeper water, so that the Muskrat is more secure as it approaches its home. Such channels are very prominent when the water in a pond dries up. Short tunnels ending in a chamber are sometimes made at intervals along the edge of a pond, to be used as retreats from danger when distant from home.

The Muskrat believes in "safety first," for it avoids the attacks of many of its land enemies—such as Foxes—by building little islands or rafts of sticks, cattails and other plant stalks, on which it sits when eating. An enemy must come from the air or water to be dangerous. From the former it escapes by slipping quickly into the water. From the latter there is little chance of getting away. These rafts are kept stationary by being built around cattails or other plants growing in such places. In winter, ice does not cover these rafts completely, but snow soon roofs them over, and they serve as breathing holes when the Muskrats are swimming under the ice in search of food, for they do not hibernate to any extent.

Everything is food that comes to the Muskrat's table. Roots, stems, leaves of various water and swamp plants furnish the larger part of its bill-of-fare, while heaps of fresh-water mussel-shells (clams), at convenient landing places along the water's edge, testify to its fondness for flesh. Fish, frogs and other aquatic animals also form part of its diet.

When the snow and ice have melted and the warm spring rains have covered the land with the tender green of awakening vegetation, the Muskrats mate, and savage fights may take place for the possession of a desired female. The four to twelve young are born in early May in the latitude of the Eastern States, and are blind and helpless, but in about three weeks have grown so rapidly that they can nearly care for themselves. This is necessary, for a second and even a third litter may follow them during the summer. In some localities four or five litters are said to be produced in one breeding season. By the end of the summer the young of the first lot are able to raise families of their own.

It is fortunate for them that Muskrats are so prolific. Otherwise they could hardly hold their own against their many enemies. To live a long life a Muskrat must be ever on the alert. Some of the large, hawks and owls attack it from the air; wolves, foxes, lynxes, weasels, wolverenes and many other animals prey upon it when it ventures on land; otters and mink are able to follow it in the water; and the bigger members of the pike family may seize it from below. The mink, however, is the worst of these, for it can follow the Muskrat into its home. Like the Beaver, the Muskrat is most susceptible to attacks from its land enemies when it goes on voyages of discovery from one body of water to another, as it often does in late fall. It is no coward, and will fight to the death. It has been known to attack even a man when cornered far from a place of refuge.

J. M. Johnson.

THE FAMILY OF POCKET GOPHERS

(*Geomyidæ*)

THE Pocket Gophers are the only rodents to which the term "gopher" can be accurately applied; although it has been wrongly used for other burrowing animals of the Ground Squirrel tribe. The family *Geomyidæ*, however, are our only true American Gophers, and are numerous enough and pestiferous enough to warrant all the harsh things that have been said about "Gophers" indiscriminately.

Pocket Gophers

Geomys bursarius (*Shaw*)

Other Names.—Prairie Pocket Gopher, Red Pocket Gopher.

General Description.—A medium-sized burrowing rodent with small eyes and ears. Head broad and blunt; eyes very small; ears small; external cheek pouches fur-lined and opening on sides of face; incisor teeth large and prominent; body rather thickset; tail short, thick and very scantily haired; legs short; claws long, especially so on the fore feet; fur rather short but very soft; general color dull chestnut-brown, under parts paler. A burrowing animal little seen, but throwing out conspicuous mounds of earth.

Measurements.—Total length, 11 inches; tail bones, 3.2 inches; hind foot, 1.4 inch.

If the farmers and fruit growers of the United States were polled on the question, "Which of the rodents, Field Mice, Rabbits, or Pocket Gophers, do you consider your worst pest?" the probability is that the unenviable distinction would be conferred on the Pocket Gopher.

The three genera of this family that occur in the United States are known from one another by the kind of grooves which they have on their upper front teeth. In the largest genus, *Thomomys*, the upper incisors have each a very fine groove on the margin or none at all; in the genus *Geomys*, the species have two distinct grooves; and in *Cratogeomys* there is one median furrow only. It is these sharp, powerful incisors which cause all the trouble for the farmer. Not only are they used in digging burrows or tunnels, which often admit surface water, leading to the washing of deep gullies, and sometimes cause breaks in canal banks and levees, but with them these "pesky little varmints" gnaw the roots of fruit and other trees, causing serious damage. Mr. David E. Lantz (Yearbook of U. S. Dept. of Agriculture) relates that in Heppner, Oregon, the owner of an orchard was absent from home but a week, and found on his return that Gophers had destroyed forty of his choice fruit trees. Originally these animals fed on the stems and roots of native plants; but no sooner had the settler introduced cultivated grasses and vegetables than the Gophers turned their attention to clover, alfalfa, and the succulent products of the gardens.

GEORGIA POCKET GOPHER

From a photograph by R. W. Shufeldt

THE FAMILY OF HARES AND RABBITS

(*Leporidæ*)

THERE is a great deal of popular confusion between the terms "hares" and "rabbits." To most people they mean the same thing; when as a matter of scientific fact they are two separate groups, each with its own well-defined species.

This distinction is all the harder to make because the two animals have long been given interchangeable names. For example, our Jack Rabbits and Snowshoe Rabbits are not Rabbits, but Hares. On the other hand, the animals known as the Swamp Hare and the Pigmy Hare belong to the Rabbit group, as do the "Cottontails." In the case of the Jack Rabbits, the erroneous name has now been in use for more than half a century. As long ago as 1851, Audubon and Bachman, writing of a species found along the Mexican border, said: "This species is called the jackass rabbit in Texas, owing to the length of its ears." For the same reason, in certain parts of California they have been called "narrow-gauge mules" and "small mules." At this late day it is just as useless to attempt to change the name of the Jack Rabbit as it is to try to persuade the public to adopt the name Bison for the Buffalo; but it should be borne in mind that the Jack Rabbit is not a Rabbit, but a Hare.

There are certain well-defined characteristics by which Hares can be distinguished from Rabbits. The former never make burrows, but live in "forms" or nests of a kind (in which the young are brought forth), and are long-eared, long-legged, and swift-footed animals, the hind legs being considerably longer than the fore legs. Rabbits proper have short ears, are short-legged, cannot maintain much speed for any great distance, and all of them make more or less use of burrows—frequently the abandoned homes of other animals—or of sheltering tree-roots, rocks, or similar places. Some of the species make their own burrows or tunnels. The young Hares are born with a well-developed coat of hair and with their eyes open; baby Rabbits are born naked and with closed eyes.

Hares and Rabbits are among the best known of American mammals. They range from northern Greenland to Patagonia, and over the entire breadth of the two continents.

VARYING HARE

LEPUS AMERICANUS *Erxleben*

OTHER NAMES.—American Hare, Snowshoe Hare, White Hare (or "Rabbit").

GENERAL DESCRIPTION.—A good-sized rodent with large ears, long legs, and very short tail. Head broad; nose blunt and rounded; eyes large; ears exceedingly large, thickly covered with short hairs; body of good size; tail very short; legs long, hind legs longer than fore legs with much larger feet; soles of feet exceedingly hairy; toes, five in number on fore feet, four on hind feet; fur of two coats, a shorter under fur and a longer outer coat. Generally an animal of timid, nervous temperament.

MEASUREMENTS.—Total length, 19 inches; tail bones, about 1.5 inch; hind foot, 5.5 inches. Weight, about 3 pounds.

THE Varying Hare changes his coat twice a year, in spring and autumn, —hence his name. He is often called "Snowshoe Rabbit," because the elongated track he makes in the snow looks like a diminutive snowshoe track. The popular story that he changes his coat in a single night or with the first snowfall is untrue. The change is gradual and accomplished by shedding and new growth. There are two Hares in this group, the Washington Varying Hare and the Oregon Snowshoe "Rabbit," whose coats do not turn white in winter. It is worth noting that most of the southern forms in the summer coat have the upper part of the hind feet brown similar to the body, whereas the northern and the high mountain Hares have the tops of the hind feet white.

Varying Hares are a favorite prey of the bald and gold eagles, several of the hawks, and the snowy, great-horned, and some other owls, while among their four-footed foes must be reckoned the lynx, wolf, fox, sable, mink, weasel, and ermine, besides domestic dogs and cats. Indians make good use of the skins for robes, mittens, and caps.

COTTONTAIL RABBIT

SYLVILAGUS FLORIDANUS *(Allen)*

GENERAL DESCRIPTION.—A medium-sized Rabbit with a short tail having a clear white under side, and carrying the tail over the back to show the white. Head fairly large; eyes large; ears of good size, fairly broad; body moderately robust; tail short; legs fairly long but hind legs not excessively longer than fore legs; fur long, thick, and soft; general color buffy gray mixed with black above; under parts grayish-white. An animal of bushy areas.

MEASUREMENTS.—Total length, 18 inches; tail to end of hairs, 2.5 inches; hind foot, 3.4 inches; ear from notch, 2.3 inches.

THE Cottontail, or Gray Rabbit, is a smaller animal than the Hare, and has, as a rule, shorter ears and shorter and weaker legs. Most of the species make use of burrows, openings in and under rocks, the abandoned homes of other mammals, or, if no dogs are about to chase them, a hole under a house or other building. Their color enables them to lie undetected in a tuft of overhanging grass, or a bunch of briers or bushes. In parts of Texas they live among the big bunches of prickly pears, seeming to ignore the presence of thorns in and along their trails. One of their favorite resorts for a mid-day nap is in or among the big flat pads of a prickly pear, where they will stick to their form until fairly forced out. The long-eared or Arizona Cottontails make use of Prairie Dog holes to such an extent that the ranchmen call them "Prairie-dog Rabbits."

JACK RABBITS

From a habitat group in the American Museum of Natural History

The Cottontail is one of the most familiar objects of our open fields. As the passer-by on a casual stroll comes too near its retreat, away it will scurry, its short, white stump of a tail waving defiance; or, more likely, it is the white flag of truce, for they are at heart timorous creatures. When captured, they will submit to half-taming, but always with a weather eye open to a means of escape. When placed in a cage they do not eat proffered food while their captor is present, but will remain stock-still for minutes, perhaps hours, at a time.

Their favorite food in summer is the inner bark of young trees and shrubs, green twigs, leaves, buds, and berries. As they do not store up food for the winter and do not hibernate, they eke out a rather scanty subsistence in the cold season from occasional wild rose or other hardy berries, and the bark of bushes. By spring they are lean and continually hungry. Indeed, they never seem to get enough to eat.

NUTTALL'S COTTONTAIL

From a photograph by H. E. Anthony

These Rabbits breed rapidly, often raising three litters in one year. As there are from four to six young at a birth, they would rapidly become a menace, if not kept in check by larger animals and birds of prey.

The females of this species make soft, warm nests of fine grass, leaves and other vegetable material, lined with hair from their own bodies, and in these the young are born and lie concealed, like mice in a nest, while small and helpless. But they speedily gain strength and agility.

THE OPOSSUM FAMILY

(*Didelphidæ*)

POUCHED Mammals, also known as Marsupials, are one of the most remarkable and distinctive of all the orders. Most of its members are confined to the Australian region, the Kangaroo being the most familiar type. Only one member, the Opossum, is found in North America.

The order takes its name from the external abdominal pouch of the female, in which the very small young are carried. A number of points in the embryology of the Marsupials, such as the extremely early birth and undeveloped condition of the young, show a wide separation from other orders. The one American family belongs to the *Polyprotodont* section of the order, so called because of the character of the teeth, which are differentiated into incisors, canines, and molars.

The Opossums are a group that reach their greatest abundance in tropical and South America. North of the Rio Grande only three subspecies are found. There is little liability of confusing this animal with any other North American type; the long prehensile tail, the grasping hind foot, the marsupial pouch, and the number of teeth are sufficiently characteristic to identify the Opossum, being found in no other mammal of this continent.

OPOSSUMS

From a habitat group in the American Museum of Natural History

Virginia Opossum

Didelphis virginiana *Kerr*

General Description.—A good-sized mammal with long gray hair, about the size of a house cat, but with a long, naked tail. Head long and slender; muzzle bare; eyes small; ears large, naked; body rather thick-set; tail prehensile; marsupial pouch present; limbs short; feet with five distinct toes, each provided with nails; first toe of hind foot, which is nailless, large and opposed to others for grasping; soles of feet naked; fur externally composed of long coarse hairs in color grizzle gray; teeth sharp. An arboreal animal, and the only marsupial found in the United States.

Measurements.—Total length, 30 inches; tail bones, 12 inches; hind foot, 3 inches.

The pouch of the Opossum is on the lower side of the body, and serves as a nursery for the young. The young, from six to twelve, are born in a very immature state, blind, helpless, hairless, and very small, weighing from eighteen to twenty-five grains. They crawl to the pouch and into it, each seeking a nipple, where they are nourished and kept for about six to eight weeks. After this they venture out and climb over the body of the parent, clinging to her fur. At times the mother arches her tail over her back, as the Squirrel often does, and the little ones cling to it by their prehensile tails, heads down, and the forward feet touching her back, presenting a curious sight indeed! For a few weeks after the young are able to climb out of the pouch they do not venture upon the ground, but return to the pouch for food and protection.

The Opossum is nocturnal in its general habits; emerging from its retreat at the close of day. However, I have seen it abroad many times on cloudy days, and occasionally in the bright sunshine. Its menu is varied, but you may be sure it is a full one when it can be procured. Nature has provided the Opossum with teeth and a digestive apparatus indicating its omnivorous character, and an appetite for nearly all kinds of food. In its love for corn it resembles the Raccoon, breaking the stalks in the same manner and feeding upon the tender young kernels. An important part of its food consists of insects of various kinds. The Opossum is very destructive to the ground-nesting birds, destroying eggs and young alike, whenever found. If an opportunity comes his way he dines from the poultry yard, and here he shows a decided preference for young chickens. But he should also be given full credit for the mice, moles, and young rabbits that he destroys.

It is in the South, on his native heath, that the Oppossum reaches his greatest growth. For him the October sun and the frosts of November mature the juicy persimmon; and from early evening until break of day he lingers at Nature's banquet.

O heedless Opossum! Could you but see into the future you would not feed thus recklessly upon the fruit, which in a few weeks must render you so temptingly fat! "'Simmon" time brings in "'Possum" time, and from many a cabin the melodious negro voices, accompanied by banjo, are heard singing:

"'Possum am a cunnin' thing,
He rambles in de dark,
Nothin' 'tall disturb his min'
But to hyah my bulldog bark."

SILAS. A. LOTTRIDGE

THE MOLE FAMILY

(*Talpidæ*)

MOLES furnish one of the strangest and most interesting marvels of Nature's handiwork. Here is a group of mammals destined from birth to life-long blindness; spending their whole lives in subterranean darkness; digging, digging, digging, in order to obtain the food necessary for their subsistence; rendering to the farmer a service that is simply inestimable in its value, yet regarded as animals worthy only of complete extermination. When of a morning we look upon the little ridges of new-turned soil disfiguring our lawns, we instinctively say, "Those wretched moles again!" forgetting that the little shovelers have simply been working where they best could find their food. It is true that sometimes the tunnels dug by moles admit of the incursions of rodents which injure tubers, roots, and planted seeds; but it has yet to be proved that the harm done by Moles is not more than offset by their destruction of cutworms, wireworms, and other noxious pests of the husbandman.

So highly specialized are the Moles for a burrowing life that they possess structures found in no other mammals and consequently are quite easily identified. The very large forefeet, minute eyes and ears, short, thick tail, and velvety fur are strictly Mole characteristics.

The Moles of America are now classified by naturalists in five genera. Mr. Hartley H. T. Jackson, of the U. S. Bureau of Biological Survey, in "A Review of the American Moles" says: "Moles occur rather generally in eastern North America along the Atlantic and Gulf coasts from Labrador to Florida, and in northeastern Tamaulipas, Mexico, and range westward to Manitoba and northeastern Colorado. Within this area are found three genera, *Scalopus*, *Parascalops*, and *Condylura*. West of this area no Moles are found until the Pacific coast region is reached. There, two other genera, *Scapanus* and *Neurotrichus*, occur, their ranges being confined mainly to the humid and semi-humid region west of the Cascade Range, and the Sierra Nevada, from southern British Columbia to northern Lower California."

COMMON MOLE

SCALOPUS AQUATICUS (*Linnæus*)

OTHER NAMES.—Eastern Mole, Naked-tailed Mole.

GENERAL DESCRIPTION.—A thick-set burrowing mammal with large and broad forefeet. Head narrow and pointed; muzzle naked and hog-like; no noticeable external ear;

eyes small and not visible externally; teeth numerous and sharp; neck very short; tail short and thick, nearly naked; limbs short; fur soft and velvety. Strictly underground in habit.

MEASUREMENTS.—Total length, 6 inches; tail bones, 1 inch; hind foot, .8 inch.

IT has been aptly remarked that there is no common animal less common than the Common Mole. The disfiguring results of its labors are prominent on the lawns and in the fields; but the animal itself is seldom seen, and its habits are comparatively little known. It is most plentiful in meadows, gardens, and similar habitats, but is by no means confined to them, and frequently is found in open woodland, along the banks of streams, and in other environments.

The little mounds and ridges of upturned earth seen on our lawns are not true molehills, but merely the soil thrown up to the surface by Moles in digging their tunnels. Few persons have any idea of the rapidity with which these passages are excavated. The Mole's forepaws are about three-quarters of an inch wide and the palms are turned outward. Mr. Edward T. Martin, who has watched the animal at work, says: "In throwing dirt behind, it uses a motion like a boy in swimming, bringing the hands forward until they touch in front of the nose, then thrusting them outward and backward to push the soil aside, the body following in the passageway thus made."

The quickness with which a Mole works and the distance that it can tunnel in a given time are almost incredible. In a single night a Mole has been known to tunnel more than seventy-five yards; Dr. Merriam traced a fresh tunnel nearly a hundred yards; and Dr. Hornaday, observing the work of a Mole he had placed in a clover field at eleven o'clock in the morning, found that during the first seven hours it had tunneled twenty-three feet, in a zig-zag line. During the next seventeen hours thirty-five feet, and during the next hour ten feet more. The total work consisted of sixty-eight feet of main line and thirty-six and a half feet of branches, making in all one hundred and four and a half feet.

Proportionately to the animal's body, the arm and forearm are of enormous size; and, as has been seen, tremendously powerful. Sometimes the tunnels are but five or six inches below the surface; but they have been found at a depth of four feet or more, undoubtedly the result of the Mole pursuing its prey into moister regions.

This strange little beast seems adapted by nature to the simplest and most mechanical of functions. Its senses are rudimentary, that of sight being almost entirely lacking. Its eyeball is only about the size of a pinhead, and probably all it can distinguish is strong light from darkness. The changing seasons and all the bright busy world above it pass unheeded, in its blind, patient search for food, and still more food.

THE SHREW FAMILY

(*Soricidæ*)

SHREWS include the smallest of all mammals. These animals, some of them but little more than three inches long, are sometimes mistaken for Moles and, more often, as they scuttle off through the grass or fallen leaves, for Mice. In the gardens and in the woods, in the dry fields and in swamps and marshes, on the plains and in high mountains, a Shrew of some sort is usually to be found.

Many of the Shrews are hardy little creatures, and some of the northern species may be seen abroad even in the cold of an Arctic winter. Although they are classed among the insect-eating mammals, insects are not their only food. Dr. D. G. Elliot says: "They do not confine themselves by any means to an insect diet, but devour worms, small birds, or any scraps of meat that fall in their way."

The Shrews have well-furred bodies and well-developed tails usually covered with short hairs. The eyes and ears are small; the feet are slender or only slightly widened. Most of the Shrews are terrestrial, but a few are aquatic.

COMMON SHREW

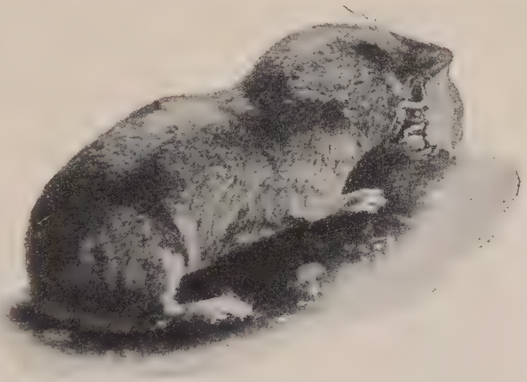
SOREX PERSONATUS *I. Geoffroy*

OTHER NAMES.—Long-tailed Shrew, Cooper's Shrew, Masked Shrew, Shrew Mouse.

GENERAL DESCRIPTION.—A very small mammal with a sharp nose, small eyes, and fairly long tail. Ears small and nearly hidden by hair of head; teeth sharp and stained with chestnut at the tips; body slender; legs short and slender; fur thick and soft. An active, quick-moving little animal.

MEASUREMENTS.—Total length, 4 inches; tail bones, 1.5 inch; hind foot, .5 inch Weight, 2.85 grammes, or 43.95 grains.

This little animal makes its home in the hollow parts of fallen trees, under wood piles or logs, or in any sheltered place where it is likely to be undisturbed. It does not burrow; but Mr. Theodore H. Scheffer, of the U. S. Biological Survey, has found that it is a frequent trespasser in the underground galleries of the Mole. Though not aquatic, it prefers to dwell near some small stream that will not freeze in winter nor run dry or stagnate in summer. A very dry summer means death to numbers of Shrews. In winter the Common Shrew may be seen poking its snout into the little openings in the bark on the lower parts of tree-trunks, and ferreting about in the leaf mold or among pieces of decayed wood for its daily bread. It is supposed that the species mate without much regard to seasons, but on this point little is known definitely.



SHORT-TAILED SHREW

Considering its size, the Shrew may be considered one of the most pugnacious of all animals. Mr. Fred E. Brooks says: "I recently placed a Shrew, about two-thirds grown, in a box with a mature and very large Meadow Mouse. They lived together for about a week before they were separated, but the relationship between the two seemed at all times to be decidedly strained. Each seemed to fear the other, although the Mouse was at least four times the size of the Shrew. I fed the two a great many grasshoppers, of which both were very fond. The one that got hold of a grasshopper first would keep it without personal violence being resorted to by the other for its possession. When the Mouse was eating food that the Shrew desired, the latter would often take a position near at hand, usually at the mouth of one of its burrows in the moss with which the box was partly filled, and indulge in a peculiar and rather amusing performance. With its mouth wide open and its snout and lips drawn back so as to expose its sharp teeth, it would throw its head rapidly from side to side and give forth a peculiar, song-like chatter consisting of a series of rapidly repeated chirps, pitched on a high key, and varied every few seconds with a long-drawn, rasping note on a lower key. While thus engaged it would assume a perfectly fiendish look and express in the most realistic manner all the anger and envy and hate that was in its little heart."

House Mice, White-footed Mice and Meadow Mice, when confined in a cage with Shrews, will often manifest the most abject terror, and will jump and rush about as though panic-stricken until exhausted.

THE BAT FAMILY

(Order, *Chiroptera;* family, *Vespertilionidæ*)

ONE of the strangest of all animals is the Bat. Partaking in its powers of flight of some of the habits of the birds, it is nevertheless a true mammal. It cannot even be regarded as a connecting link between the two kingdoms.

Bats occupy an order by themselves, which is as sharply defined as could be devised. They do not encroach upon any other order; neither do other mammals show traits belonging to the *Chiroptera*. The members of this order are true mammals with the fore limbs modified for flight. The bones of the arms and fingers are enormously elongated and drawn out; across this slender framework extends the flying membrane, a thin fold of skin, which reaches to the sides of the Bat; and from the fingers to the hind limbs on the ankle joint a cartilaginous process, the calcar, helps to support another portion of the flight membrane, which extends from ankle to ankle and envelops more or less of the tail. Peculiar modifications to further the power of flight are the rudimentary ulna, the long curved radius, the short thumb bearing a claw and long fingers with no claws, and the outwardly-directed knee joint. Other structures characteristic of Bats are the specialized ears with the peculiar upstanding process, the tragus, the thoracic mammary glands, and often accessory structures upon the nose and lips. When they sleep or rest, these odd creatures hang head downward, holding to their perch by means of the claws of their hind feet.

Bats are night-loving animals. Their flight is erratic and often swift despite the fact that their eyes are quite small. They are widely distributed over America as well as over other countries, but, because of their secluded habits and love of darkness, few persons know much about them.

The Order is divided into two sub orders--the *Megachiroptera*, or Fruit-eating Bats, found only in the Old World; and the *Microchiroptera*, the Insect-eating Bats, of smaller size, which are found in nearly every land.

COMMON BROWN BAT

EPTESICUS FUSCUS (*Beauvois*)

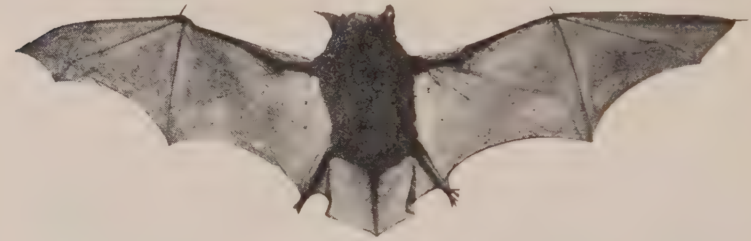
OTHER NAME.—Big Brown Bat.

GENERAL DESCRIPTION.—A small flying mammal with leathery membrane stretched across the greatly lengthened fingers and extending along sides of body to include the hind legs and tail. Head small; nostrils simple; eyes minute; ears large and broad, with a broad tragus or process on front part of ear conch; fore limbs long with fingers enormously lengthened, slender, and only the thumb, which is short and rudimentary, provided with a claw; body small and muscular, especially thick through the chest; hind limbs much shorter than fore limbs, slender, with five toes, each bearing a claw, the toes of nearly equal length; tail fairly long, nearly half of total length and completely inclosed in the "wing" membrane; flying membrane extending from the fingers to sides, to the ankle, and thence to include the tail, naked everywhere except for a few scattered hairs on back of membrane; body covered everywhere with long soft fur of a brown color, paler below. A strictly nocturnal mammal.

MEASUREMENTS.—Total length, 4.5 inches; tail bones, 1.7 inch; hind foot, .4 inch; forearm, 1.7 inch; spread of wing, 12 or 13 inches.

THE lack of common knowledge about Bats is remarkable. Many persons fear them, although our native Bats are weak and harmless. The great majority of Bats are useful to man in destroying bugs and insects. The more dangerous species, such as Blood-suckers, or Vampires, inhabit the tropics. "To be 'as blind as a Bat' is not to be blind at all," says Hornaday, "but rather to possess powers of vision that are uncommonly good in semi-darkness, or at night, and fairly good even in the broad light of day. When disturbed at midday, all the Bats I have seen alive (perhaps twenty species in all) have flown away to places of security as briskly and successfully as so many swallows. The eyes of all night-flying Bats are small, jet black, and look like tiny black beads, but those of the day-flying Fruit-Bats are very much larger in proportion."

As previously remarked, very little is known regarding the habits of the Bats, chiefly because their nocturnal habits make it very difficult to find them, or to observe them. We know that in winter some of our species live in caves, in a semi-dormant condition. Dr. C. H. Eigenmann says, of the thousands that inhabit Mammoth Cave, "they fly readily if disturbed in the summer, but in winter they hang apparently dead. If disturbed, a few respiratory movements may be seen, and they may utter a few squeaks, when they again remain apparently lifeless. If knocked from the roof some of them fall to the bottom of the cave and flap about, others fly away. I have seen them leave a cave in midwinter, after being disturbed, but fly no further than a hundred yards, then turn and enter the cave again."



COMMON BROWN BAT
Courtesy of American Museum of Natural History

In central Montana, where there are no trees, a large colony of Bats inhabit a cave that a subterranean stream had washed under the prairie.

In the warm countries, Bats inhabit hollow trees. But it is questionable whether they inhabit such homes and actually hibernate in them in winter, in the temperate zone, or migrate. Dr. C. Hart Merriam has proved that some Bats of the North American temperate zone do migrate.

Bat's wings seem to have a delicate nervous organism, which enables them to feel that they are approaching an object before they have actually touched it, and then they fly in another direction.

The Bat's flight, while seemingly aimless, is actually purposeful; for it is while flying that the Bat gets his food. He feeds wholly upon insects, chiefly those that fly by night, and at every sudden turn we see him make, we may assume that he has captured an insect.

Brown Bats make their appearance late in the evening; they fly lower than the Red Bats; and they may be distinguished by their great size.

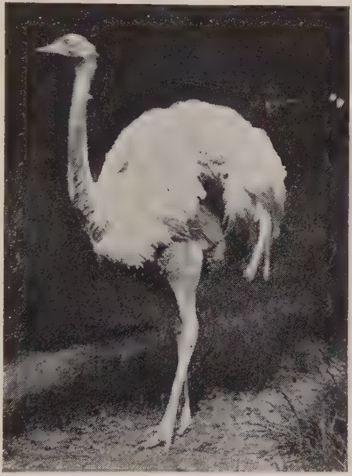
FRIENDS OF THE ZOO

INTERESTING BIRDS OF OTHER LANDS

The Rhea

THE Rhea is a native of South America. It is frequently referred to as the South American Ostrich, and also as the Nandu. The resemblance which it bears to the true Ostrich is striking, but it may at once be distinguished therefrom by the fact that it has three toes and a feathered head and neck; furthermore, it is smaller in size, and lacks the conspicuous white wing and tail plumes. Its wings though not strong enough to raise its heavy body from the ground, are yet of considerable size.

Courtesy of the New York Zoölogical Society



RHEA

FROM A PHOTOGRAPH BY E. R. SANBORN

In Buenos Aires, Rheas are hunted with dogs. If a breeze is blowing, the birds raise one wing, which acts as a sail. This done, they can acquire a speed which makes it absolutely impossible for either dog or horse to come up with them. The only chance of ultimately capturing them is by wearing them out by ceaseless pursuit. A chase of this kind may last an hour and a half. Needless to say, for sport of this kind both horses and dogs must be the best of their kind and in "good form."

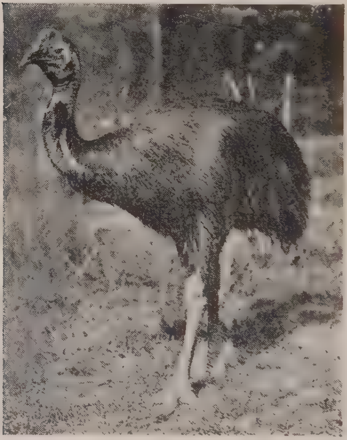
The natives and Indians hunt them on horseback with the "bolas." The bolas, or balls, used for this purpose consist of two round stones covered with leather, and united by a thong about 8 feet long. One of these is held in the hand and the other whirled around the head and suddenly released, when both go whirling madly round till they strike the Rhea's legs, around which they instantly twist, and the victim is a fast prisoner.

The Ostrich

The Ostrich is the giant amongst living birds, the full-grown male standing some 8 feet high, and weighing about 300 lbs. It is flightless, the wings being smaller, in proportion to the size of the body, than in the Rhea. But the energy which in other birds is employed in sustaining flight, in the Ostrich is expended in running, so that it has reached a high degree of speed—no less, in fact, than twenty-six miles an hour.

The egg of the Ostrich weighs about 3 lbs., and is of delicious flavor. The empty shell, it has been found by experiment, is large enough to hold the contents of eighteen eggs of the common domesticated fowl. It takes about forty minutes to boil an ostrich egg hard. About fifteen eggs represent the clutch. The nest is a mere depression in the sand. The hen sits by day, and her mate by night; but the eggs are never left, as is sometimes stated, to the heat of the sun, so as to lessen the duties of the parent. Such a course would infallibly destroy the eggs, for the sun's rays, especially at noon, are very powerful.

Courtesy of the New York Zoölogical Society



CASSOWARY

FROM A PHOTOGRAPH BY E. R. SANBORN

The male and female Ostrich differ much in coloration. In the former the trunk is clothed in a vestment of richest black, whilst the quills of the wings and tail-feathers are of pure white: they form the much-prized Ostrich plumes. The female is much less splendid, being clothed in sober gray.

Cassowaries

With the Cassowaries and Emus we have come as near as we can get at the present day to the representatives of the ancient type from which the Ostrich Tribe have sprung. But both these forms are to be regarded as having passed the prime of their development, for, like their allies which we have already considered, they have lost the power of flight.

The lot of the Cassowary appears to have been cast in pleasant places, making it possible to indulge in the luxury of personal decoration—a decoration, moreover, shared equally by the males and females, both sexes having the head and neck most brilliantly colored. In some species all the hues of the rainbow are vividly reflected. To show these colors, the feathery covering, still worn by their relatives on the distant continents of Africa and America, has been cast off and the skin left bare. To these gorgeous hues they have added yet other features, for the head is surmounted in many species by a huge casque, or helmet; whilst from the neck depend curious fleshly lobes, or wattles, colored in accordance with the rest of the bare, colored skin of this region. Then, too, they have effected quite a novel transformation in the quills of the wing, for these project on either side of the body in a series of shining black spines. Nor is this all, for over and above the energy which they have to spare for personal decoration is a very large reserve to be expended in fighting.

Courtesy of the New York Zoölogical Society

EMU

FROM A PHOTOGRAPH BY E. R. SANBORN

THE EMU

THE Emu, though a sort of Cassowary, boasts none of its splendor; on the contrary, it is a dull, dowdy-looking bird. In size, however, it is larger than the Cassowary. The wings, which are exceedingly small, have numerous tiny quill-feathers—not long, hard spines, as in the Cassowary.

A very remarkable and quite unique structure in the Emu is a curious bag or pouch, formed by a sort of outpocketing of the inner lining of the windpipe. Strangely enough, it is found only in the female, and is used by her chiefly during the breeding-season, when she utters a peculiarly loud booming note, which, it is supposed, is caused by the manipulation of the air in the pouch. When moved by any gentle excitement or pleasure, especially on damp evenings or in the dead of night, she also becomes musical, giving forth a note which has been likened to a gong or muffled drum.

Incubation is performed by the male, which sits from fifty-four to fifty-six days. Practically no nest is made, only a shallow hollow being scraped in the sand. The eggs, from seven to thirteen in number, are of a dark bottle-green color, sometimes lighter, and have the surfaces curiously roughened. The male is smaller than the female, a fact which has led to some confusion, the larger female having at one time been regarded as the male. It will be noted that the Emus not only lack the brilliant color of the Cassowaries, but also the helmet, or casque.

PHEASANTS

THAT ornament to all rural scenery, the English Pheasant, is said to have been introduced from the banks of the River Phasis, in Colchis, Transcaucasia, by the Romans.

Beautiful as this Pheasant undoubtedly is, it is eclipsed by many of its relatives. Among the most noteworthy of these we may notice the magnificent Tragopans. Rich in coloration of the feathers, these birds have added an additional feature in brilliantly colored areas of bare skin on the head and neck, which are furthermore rendered conspicuous by being developed with "horns" and wattles. These "horns" can be erected at will, a process which causes them at the same time to be greatly increased in size. The bird, with a proud consciousness of his beauty, displays his charms to the full when wooing.

Equally splendid, some think more so, are the four species of Pheasant known as Monauls or Impeyan Pheasants. The plumage in this case looks like burnished metal rather than feathers.

But the most gorgeous of all the Pheasant Tribe are perhaps the Golden Pheasants. The crimson body and exquisitely beautiful collar of gold barred with black constitute a perfectly royal livery. Since, however, these are amongst the commonest occupants of the aviary, we need not describe them further here. They are natives of China and Tibet.

Courtesy of the American Museum of Natural History

ENGLISH PHEASANT

(MALE)

The Peacock

The Peacock is too well known to need a very long description. But a word as to the so-called "tail." This magnificent wealth of plumes does not represent the tail, as is popularly supposed, but is made up of the feathers of the lower part of the back and the upper tail-coverts. These gradually increase in length from before-backward, culminating in the long and exquisite feathers which form the circumference of the huge, outspread shield. This shield is properly called the "train"; the true tail lies behind it and acts as a support. When the bird is about to display, the "train" feathers are slowly and gently raised till the well-known fan-shaped glory of green and gold and blue is exposed to the fullest extent.

Watch the bird trying to do his best to persuade his chosen what a handsome fellow he is. He first places himself more or less in front of her, but at some little distance off; and then, watching his opportunity, walks rapidly backward, going faster and faster, till, arrived within a foot, he suddenly, like a flash, turns round and displays to the full his truly gorgeous vestments. This turning movement is accompanied by a violent shaking of the train, the quills of which rattle like the pattering of rain upon leaves. Often this movement is followed by a loud scream.

PEACOCK

This bird is a native of India, where it is held in great reverence by the Hindus.

In classical mythology the Peacock appears as the favorite bird of Juno; hence the early Greeks must have had an acquaintance with it, and wished to show it honor.

PENGUINS

THE Penguins may justly be called wonderful birds, and they are undoubtedly of very ancient descent. For countless generations the sea has been their home and refuge, and, in consequence, flight has been abandoned in exchange for increased swimming-powers, which have been gained by transforming the wing into a paddle. This transformation has resulted in flattening the wing-bones—and so increasing the surface of the hand and arm whilst reducing its thickness—and the suppression of quill-feathers. The result is a blade-like paddle closely resembling the paddle of the whale, the turtle, or the extinct fish-lizards. With this organ they cleave their way through the water, often far below the surface, in pursuit of food, just as of old their ancestors did through the air. In other diving-birds the wings are kept closely pressed to the side of the body when under water, whilst the locomotion is effected by the feet. The Penguin's legs, in consequence of diminished use, have shortened considerably, according to scientists.

Penguins, though confined to the Southern Hemisphere, enjoy a wide range and every variety of climate. They are found on the Antarctic ice, on the shores of South Africa, South America, Australia, New Zealand, and inhabit many islands of the southern seas, notably the Falklands, Kerguelen, and Tristan da Cunha. In size Penguins vary greatly. The largest is the Emperor-penguin of the Antarctic seas; scarcely smaller is the King-penguin of Kerguelen Island. The Emperor-penguin stands some 3½ feet high, and may weigh as much as 78 lbs.

Courtesy of the American Museum of Natural History

ANTARCTIC KING PENGUIN

The Great Bustard

Of the Bustards, the most interesting and important species is the Great Bustard. About a hundred years ago this magnificent bird might have been seen in England any day in such favored localities as the Yorkshire and Lincolnshire wolds, the Norfolk and Suffolk "brecks," the heaths of Newmarket, or the downs of Berkshire and Wiltshire. It owes its extermination to several causes, foremost among which must be reckoned the reclaiming of waste land and improved methods of agriculture. "The bulk of its body," says Professor Newton, "renders it a conspicuous and stately object; and when on the wing, to which it readily takes,

Courtesy of the New York Zoölogical Society

GREAT BUSTARD

FROM A PHOTOGRAPH BY E. R. SANBORN

its flight is not inferior in majesty to that of the eagle." The expanse of the outstretched wings of a Great Bustard is 8 feet, or even more; and the weight of the male may even exceed 35 lbs. The female is smaller.

To see the Great Bustard in a wild state to-day, one would have to travel to Spain. And if one could make a pilgrimage for this purpose during the bird's courting season, some very wonderful antics on the part of the male would be witnessed. These antics make up what is really a very elaborate love-display. In this performance the bird inflates his neck with wind, draws his head closely down on the back, throws up his tail, so as to make the most of the pure white feather underneath, and sticks up certain of the quill-feathers of the wings in a manner that only a Great Bustard can.

Courtesy of the New York Zoölogical Society

CRANE

FROM A PHOTOGRAPH BY E. R. SANBORN

CRANES

CRANES vary much in general appearance. Some species have much of the skin round the head bare and brilliantly colored, such as the Sarus Crane of India and the Crowned Crane.

The White and Whooping Cranes are birds of wondrous beauty. The first-named species has been not inaptly called the "lily of birds." The whole plumage, with the exception of the black quills, is white. The legs are red, as is also the face. Dr. Coues once mistook one of these birds—the Whooping-crane—for an antelope. He and a companion saw what they "took to be an antelope standing quietly feeding, with its broad white stern toward us, and only about 500 yards off."

Another very remarkable species is the Crowned Crane. This is an African species, and takes its name from the tuft of curiously modified feathers on the top of the head.

The Seriema is a very hawklike-looking bird; indeed, by some ornithologists it has been regarded as closely allied to the Hawks and Eagles, and more especially to the Secretary-bird. Really, however, it is a very ancient kind of Crane.

The Trumpeters, the Courlans, the Kagu, and the Sun-bittern are other ornithological puzzles. Concerning the precise affinities of these birds much is yet to be learned; they are, however, undoubtedly related to the Cranes. The last mentioned is a small bird, with wonderfully beautiful wings, which it displays with great effect to its mate during the season when "courting" is in order.

Courtesy of the New York Zoölogical Society

WHITE STORKS

FROM A PHOTOGRAPH BY E. R. SANBORN

The White Stork

There are few birds which have figured more prominently in the realms of fairy-tale and fable than the White Stork. To-day it is almost universally held in affectionate regard, and in Holland, Denmark, and Germany is afforded the strictest protection, every effort being made, in localities where it is plentiful, to induce it to build its nest upon the house-roof. Sometimes, to effect this, its fondness for a stage of some sort being known, a cart wheel is set up, and this generally proves successful, the grateful bird erecting thereon its nest. Once occupied, it may be held by several generations of tenants; and year by year additions are made to the nest, so that the original shallow structure at last attains a height of several feet. The material used in its construction consists of sticks and other substances. He considers himself a fortunate man indeed who can boast a stork's nest on his house.

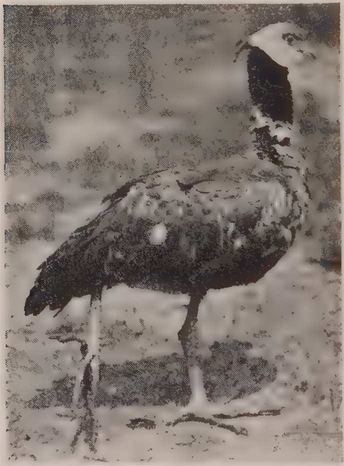
Though the nest appears to be generally placed upon buildings, it is, when these fail, built in trees, and the selection of such sites must be regarded as representing the original practice.

The White Stork is a really beautiful bird. Except the quill, and some of the smaller wing-feathers, which are black, the plumage is snow-white, whilst the bill and the legs are bright red. Like the Swallow, it performs extensive migrations, traveling in flocks, at an immense height.

SCREAMERS

VERY remarkable and extremely interesting are the Screamers of South America, of which there are three species. These are large birds, presenting some resemblances to the Game-birds on the one hand and the Geese on the other. Not only the beak, but the skull, in certain characters, recalls that of the Game-birds. The body may be described as goose-like, but in the longer legs and enormous toes, which are not connected by a web, these birds recall the Megapodes, or Mound-builders.

Courtesy of the New York Zoological Society



SCREAMER

FROM A PHOTOGRAPH BY E. R. SANBORN

The Screamers are generally regarded as primitive members of the group with which they are now associated; but in many respects they are quite peculiar. Not the least interesting of their habits is the great predilection they observe for soaring in the air at immense altitudes, uttering the while the curious cry to which they owe their name. Several birds often do this at once. Yet stranger is the fact that they not seldom gather together in vast flocks to sing in concert.

Like the Gannet, these birds are richly supplied with air-cells between the body and the skin, and between many of the muscles; so highly are these cells developed, that a crackling sound is emitted when pressure is applied to the skin.

The wings of these birds are armed each with a pair of powerful and sharp spurs, recalling those of certain of the Plover Tribe, though in the latter only one spur is present on each wing.

The South American Condor

One of the most important members of the new-world Vultures is the Condor, one of the largest of flying birds, and when on the wing the most majestic.

The Condor, like its smaller relatives, hunts by sight, and not, as was at one time believed, by smell, feeding on the dead bodies of guanacos which have died a natural death or been killed by pumas, and upon other dead animals. In the neighborhood where sheep and goats are kept, they are much dreaded, as they will attack the young kids and lambs. The flock-owners on this account wage constant war against them, capturing them by enclosing a carcass within a narrow space, and when the Condors are gorged galloping up on horseback and killing them, for when the bird has not space to run it cannot rise from the ground. Sometimes the trees on which they roost are marked, and when night falls a man climbs the tree and captures them with a noose, for they are very heavy sleepers.

SOUTH AMERICAN CONDOR

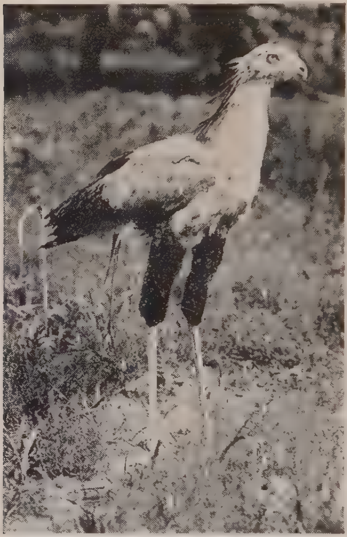
FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

The Condor ranges from the Andes of Ecuador, Peru, and Chile southward to the Rio Negro on the east coast of Patagonia. It lays two large white eggs on a shelf of bare rock projecting from precipitous cliffs, and the young are said to be unable to fly till after they are a year old. The head of the male is crowned by a bare fleshy caruncle, which, like the surrounding bare skin, is of a dull brownish color: lower down the neck is a frill of pure white, which forms a conspicuous contrast with the glossy black plumage of the rest of the body and wings.

The Secretary-Bird

The second of the three main divisions into which the Birds of Prey are divided is reserved for the Secretary-bird. This bird derives its name from the crest of long feathers which bear a fanciful resemblance to the quill-pens a clerk is supposed to stick above his ear. It differs from all the other members of the Hawk Tribe in the exceedingly long legs, which in the young are said to be so fragile as to fracture if the bird is suddenly alarmed. It feeds chiefly on insects and reptiles, especially snakes, for which last it seems to have a special liking. It attacks even the most venomous species, striking them with its powerful wings and pounding them with its feet, jumping upon them with great force, till rendered helpless, when they are at once swallowed head-foremost. On account of its great value as a snake-eater it has been accorded special protection, though unfortunately there is a tendency on the part of English settlers to relax this, on account of the fact that it will occasionally eat animals coming within the scope of "game." Valuable as the latter may be, there yet seems no justification for such a course.

Courtesy of the New York Zoölogical Society



SECRETARY-BIRD

FROM A PHOTOGRAPH BY E. R. SANBORN

The Secretary-bird, which is a South African species, though extending northward as far as Abyssinia, builds a huge nest of sticks in low bushes, under which will often be found numerous nests of the Cape Sparrow, apparently the only available site on the veldt, where bushes are scarce.

THE LAMMERGEIER

ONE of the most interesting species of old-world Vultures is the Lammergeier, or Bearded Vulture. This species is one of the least vulture-like of the tribe, not only in general appearance, but also in habits, and is to be regarded as near the ancestral stock, whose descendants have become more and more addicted to feeding upon dead bodies.

The Lammergeier, or Bearded Vulture, is a bird of large size and majestic flight, differing from all other Vultures in that the head and neck are clothed in feathers, whilst the nostrils are covered with long bristles. Beneath the bill hangs a tuft of bristles like those covering the nostrils; hence its name of Bearded Vulture; and this, coupled with a remarkable red rim to the eyes, gives the bird an almost diabolical appearance. It lives partly upon living animals and partly upon carrion, bones apparently being especially relished; these it breaks by dropping them from a height upon the rocks below, probably to get at the marrow. Land-tortoises are treated in a similar manner, and it was possibly this species which caused the death of the poet Æschylus, on whose bare head a Tortoise is alleged to have been dropped. It was at one time common in Europe, and is still fairly numerous in West Africa, though rare in the East and South. Many stories are told of its strength and daring, some of which concern the carrying off of young children; but these are probably mythical, modern observers generally agreeing that the bird is by nature far from courageous.

The Kea

Of the Parrots, one of the most remarkable is the Kea, or Mountain-nestor, of the South Island, New Zealand. Dull in coloration, and not striking in appearance, it has earned an unenviable notoriety, which appears to rest as much upon fable as upon fact. It seems that, since the introduction of sheep into this part of the world by the settlers, this bird has found a diet of flesh more stimulating than one of fruit. Exactly how this came to be is not known. Two explanations have been advanced. The first has it that the bird settled on the skins of the sheep slaughtered for their wool, and picked off pieces of fat therefrom, as well as various titbits from the carcasses of the same, and thus found out how toothsome—or beaksome—mutton was. From this they went a step further, and did the slaughtering for themselves. Parties of them now go a-hunting, worry a sheep till exhausted, then dig down through the back, and so wound the intestines that death results. Another explanation is that the birds in the original instance mistook the sheep's back for the huge masses of lichen common to this region, of which the birds are very fond. Not finding it to their taste at the top, they dug deep, and soon came to the flesh, which, like the forbidden fruit, proved more palatable than that which was provided for them by a bountiful nature. The result is, that they have become a menace to sheep-farmers, and are on this account in danger of extermination.

Hornbills

The Hornbills attract our attention by the grotesqueness of their shape, due to the enormous size of the bill, and the still more remarkable horny excrescences which surmount it in not a few species, forming what is known as a "casque."

Hornbills are forest-birds, feeding upon fruit and insects, the latter being captured on the wing. Their nesting habits are unique, and quite worth recounting here at some length. Of the many accounts, one of the most interesting, as well as one of the latest, is that of Mr. Charles Hose, of Borneo.

"The nest," he writes, "is always built in the hollow of a large tree —the hollow, be it noted, being always due to disease of the tree or the ravages of termites, not to the personal labors of the birds. The hollow of the tree communicates with the exterior air by means of a long aperture, which, just before the period of incubation, is closed up almost entirely by the male, simply leaving a long slit open, up and down which the beak of the enclosed female can move. During incubation the male bird supplies the female with food in the form of pellets of fruit, seeds, insects, portions of reptiles, etc., the pellets being enclosed each in a skin of rubber-like consistency. While feeding the female, the male clings to the bark of the tree, or sits on a branch if conveniently near, and jerks these pellets into the gaping beak of the hen, two to four pellets forming a meal."

Courtesy of the American Museum of Natural History

HORNBILL

The Quetzal

The most splendid of all the Trogons is the Quetzal, the male of which has a train of great length, resembling at first sight a tail. But, as in the Peacock, this is formed by enormously elongated tail-coverts, concealing the true tail. These tail-coverts differ, however, markedly from those in the Peacock in that they are not erectile, but pendent. The head is ornamented with a large rounded crest; the ground-color of the upper parts of the plumage is of brilliant metallic green; the under parts from the chest downward are of a deep blood-red. Certain of the covert-feathers of the wing form elegant drooping plumes, hanging down on either side and giving a wonderfully beautiful effect.

The late Mr. Salvin's account of this bird in its wild state is well worth quoting. Hunting with a native for this bird in the forest, where alone it is to be met with, he writes: "A distant clattering note indicates that the bird is on the wing. He settles—a splendid male—on a bough of a tree, not seventy yards from where we are hidden. Cipriano wants to creep up to within shot, but I keep him back, wishing to risk the chance of losing a specimen rather than miss such an opportunity of seeing the bird in its living state, and of watching its movements. It sits almost motionless on its perch, the body remaining in the same position, the head only moving from side to side. The tail is occasionally jerked open and closed again, and now and then slightly raised, causing the long tail-coverts to vibrate gracefully."

The European Cuckoo

The Cuckoo Tribe is somewhat unfortunate in that the numerous members of which it is composed are completely overshadowed by the prominence which has been given to the European Cuckoo. Few birds, indeed, have managed to secure so much attention, the poet in particular having sung its praises without stint.

Somehow or other, in Cuckoo "society" the rearing of a family is a responsibility which is utterly repudiated. Great pains seem to have been taken to evade this duty, and yet to ensure the continuity of their distinguished house. The egg-laying method of reproduction, which obtains in the feathered world, has been turned to good account—in fact, everything depends upon this. It seems to have suggested itself as far more convenient to drop an egg here and there into a neighbor's nursery, and leave the work of bringing it to life to the owners thereof. But to carry out this system of distributing foundlings requires tact, cunning, and the mutual coöperation of both male and his—at least temporary—wife; hence the disguise. The plan of execution very frequently adopted is for the male to hover over the treasure-house of the intended foster-parents hawk-wise. This is sure to call forth an attack from the poor little wretches threatened, which ends in an apparently hasty retreat of the marauder, followed by his fearless assailants. No sooner is the coast clear, however, than the wily female, taking her egg in her beak, slips quietly up to the nest and deposits her burden.

Touracos, or Plantain-Eaters

That the African Plantain-eaters, or Touracos, are related to the Cuckoos there can be no doubt, although they do not bear any very close superficial resemblance to them.

There are twenty-five different species of Plantain-eaters, which are divided into two groups—those which have red in the quills and those without. All are forest-dwellers, feeding upon various wild fruits, building a nest of sticks resembling that of a pigeon, and laying therein three white eggs. The majority of the species are crested and brilliantly colored, but a few are quite soberly clad. The largest of the tribe is nearly 3 feet long, and a brief description of its coloration will serve to convey a notion of the beauty of the more gorgeously clad members. In this species, then, the upper surface of the body is blue, the tail yellow, with a blue base and black bar across the tip, the under surface of the body rufous brown, the bill yellow, with a scarlet tip, and the eye red.

Though the tops of the highest trees seem to be their favorite resort, these birds are found also among the dense tangled masses of creepers near the ground, flitting, when disturbed, in graceful curves, and alighting with crest erected and the tail turned sharply upward. The powers of flight appear to vary among the different species, some being described as decidedly clumsy on the wing, whilst others, on the contrary, are light and graceful. Shy and very restless, they are very difficult to procure, when wounded running with great speed, and taking shelter in holes in trees.

TOUCAN

FROM A PHOTOGRAPH BY E. R. SANBORN

Courtesy of the New York Zoölogical Society

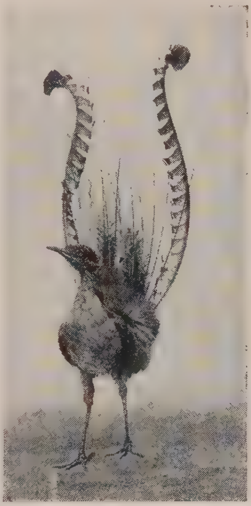
TOUCANS

GAUDY in plumage, and somewhat ungainly in appearance, it must nevertheless be admitted that Toucans form an exceedingly interesting group of birds. On account of their huge and gayly colored beaks, they have been imagined to be related to the Hornbills; but even judging by this character, the two groups may be readily distinguished; for whereas the typical beak of the Hornbill is surmounted by a large casque, the beak of the Toucan is never so ornamented. The solid appearance of the beak in the Toucan, by the way, is as much a fiction as with the Hornbill, since the horny sheath is supported, not on a core of solid bone, but on a frame of delicate bony filigree-work, the spaces being filled by air. The coloration of the plumage (which is somewhat loose in character), as well as of the bare skin round the eye and the beak-sheath, is most brilliant, and it displays immense variation amongst the different species.

Shy and restless in their habits, Toucans travel generally in small flocks amongst the forest trees and mangrove-swamps in search of food, which consists mainly of fruits and seeds, varying this diet occasionally with ants and caterpillars. It is to this diet of fruit that the great size of the bill and its peculiar saw-like edges are to be traced—at least this is the opinion of the great traveler-naturalist Bates, who had so many opportunities of watching these birds.

The long bill of the Toucan enables it to reach and devour fruit whilst remaining seated.

Courtesy of the American Museum of Natural History



LYRE-BIRD

The Lyre-Bird

Rendered conspicuous on account of the remarkable lyre-shaped tail, from which the name is derived, the Lyre-birds, on closer acquaintance, prove to be exceedingly interesting forms. The males are skilled mimics, reproducing the songs of other birds with great fidelity. During the courting-season the males construct hillocks, to which they resort to display their very beautiful and graceful tails, elevating them over the head, and drooping the wings after the fashion of a peacock, accompanying this display with certain spasmodic pecking and scratching actions. They are solitary birds, more than a pair never being seen together, and even these are exceedingly difficult to approach, stratagem always being necessary. But a single egg is laid, which has the appearance of being smeared with ink; whilst the young bird differs from that of all other perching-birds in the thickness of its downy covering and the great length of time in which it remains in the nest. The nest, made of sticks, moss, and fibers skillfully interwoven, and lined inside with the leaf of a tree-fern which resembles horsehair, is a large-domed structure, with a single aperture serving as an entrance.

Lyre-birds are essentially ground-dwellers, feeding upon insects, especially beetles and snails, and keeping to the wilder regions of the country.

The Manakins

The Manakin Family contains several species of considerable interest, on account of the peculiar modifications which certain of the quill feathers of the males have undergone. In some species what are known as the secondary quill-feathers are peculiarly twisted, and have the shafts much thickened. With these modified feathers the birds are enabled, probably by clapping the wings and bringing the thickened feathers violently together, to make a sharp sound, which has been likened to the crack of a whip. Other species have the quill-feathers of the hand—the primaries, as they are called—similarly thickened, and they probably are also used to produce sounds.

One species is known as the Bailador, or Dancer, on account of a very remarkable habit which the males have of dancing. Two males, choosing some secluded spot, select a bare twig, and, taking up a position about a foot and a half apart, alternately jump about two feet in the air, and alight again on exactly the same spot from which they sprang.

Chatterers

The group of Chatterers includes several remarkable forms of very diverse coloration, many representing the most gorgeous of all South American birds.

One of the most remarkable is the Umbrella-bird. This bird is funereal in appearance, being clothed in a plumage of deep black, with the head surmounted by a large, drooping, flat-topped crest, resembling in shape the familiar crest of certain varieties of the canary, whilst from the throat hangs a long lappet of feathers reaching nearly down to the feet. The female is duller than her mate, and lacks the peculiar plumes. The Umbrella bird is a forest-dwelling species, confined to the Upper Amazons, and dwelling in the tops of the highest trees, where it finds ample sustenance in wild fruits. But few naturalists have ever seen it in a wild state.

For brilliancy of plumage amongst the Chatterers, the palm must be given to the Cocks-of-the-rock, in the males of which orange-red predominates, whilst the general effect is heightened by crests and curiously curled and frayed feathers growing from the lower part of the back. The males indulge in remarkable love-displays, the performances being held in some open space, and in the presence of the females. One at a time each male appears to go through a kind of dance, accompanying his peculiar steps and hops with much swaying of the head and extending of the wings.

Birds of Paradise

Varying in size from a crow to a thrush, the best known of this family is the Great Bird of Paradise, which was discovered toward the end of the sixteenth century, if not earlier. On their first discovery it was supposed that these birds had neither feet nor wings and that they lived in the air, turning always to the sun, and never alighting on the earth till they died. Hence the Malay traders called them "God's Birds," the Portuguese "Birds of the Sun," and the Dutch "Paradise-birds." Seventeen or eighteen inches long, these birds have the body, wings, and tail of a rich coffee-brown, which deepens on the breast to a blackish violet or purple-brown. The top of the head and neck are of a delicate straw-yellow, the feathers being short and close-set, resembling velvet. The throat-feathers have a scaly appearance, and are emerald-green in the color. The flank-feathers on either side of the body form a dense mass of long, delicate, waving plumes, sometimes 2 feet in length, of an intense orange color, and shining with a wonderful gloss. These feathers can be raised and spread out at pleasure, so as to almost conceal the wearer in a fountain-like rain of feathers.

Courtesy of the American Museum of Natural History

BIRD OF PARADISE

ADULT MALE

BOWER-BIRD

FROM A DRAWING IN THE AMERICAN MUSEUM OF NATURAL HISTORY

Bower-Birds

Close allies of the Birds of Paradise are the remarkable Bower-birds of Australia. Conspicuously beautiful in coloration as are some members of this tribe, they are celebrated not so much on this account as for an extraordinary habit of constructing "bowers" or "playing-grounds"—a trait which appears absolutely unique among birds.

The structures reared by the Gardener-bird of New Guinea present, as Professor Newton remarks, "not only a modification of bower-building, but an appreciation of beauty perhaps unparalleled in the animal world. . . . This species . . . builds at the foot of a small tree a kind of hut or cabin . . . some 2 feet in height, roofed with orchid-stems that slope to the ground, regularly radiating from the central support, which is covered with a conical mass of moss, and sheltering a gallery around it. One side of this hut is left open, and in front of it is arranged a bed of verdant moss, bedecked with blossoms and berries of the brightest colors. As these ornaments wither they are removed to a heap behind the hut, and replaced by others that are fresh. The hut is circular and some 3 feet in diameter, and the mossy lawn in front of it nearly twice that expanse. Each hut and garden are, it is believed, though not known, the work of a single pair of birds, or perhaps of the male only; and it may be observed that this species, as its common name implies, is wholly inornate in plumage.

INTERESTING MAMMALS OF OTHER LANDS

APES AND MONKEYS

The Chimpanzee

OF ALL the great apes the Chimpanzee most closely approaches man in bodily structure and appearance, although in height it is less near the human standard than the Gorilla, 5 feet being probably that of an adult male.

Several races of this ape are known, among them the True Chimpanzee and the Bald Chimpanzee. The varieties also include the Kulokamba, described by Du Chaillu, and the Soko, discovered by Livingstone, who confounded it with the Gorilla. But the variations in neither of these are sufficiently important to justify their being ranked as species.

The Chimpanzee, like the Gorilla, is found only in Africa. It is a heavily built animal, with chest and arms of great power. The male is slightly taller than the female. The crown is flattened, the chin receding, the ridges which overhang the eye-sockets more prominent than in man, less so than in the Gorilla. The nose has a short bridge, and a flat extremity. The ear is large, and less human than that of the Gorilla. The hands and feet are comparatively long; the digits are, except the thumb and great toe, joined by a web. The arms are short for an ape, reaching only to the knees. The teeth are similar to those of man, and the canines of only moderate size.

Courtesy of the New York Zoölogical Society

CHIMPANZEE

FROM A PHOTOGRAPH BY E. R. SANBORN

THE GORILLA

THE Gorilla has a limited range, extending from 2° north to 5° south latitude in West Africa, a moist overgrown region including the mouth of the Gaboon River. How far east it is found is uncertain, but it is known in the Sierra del Cristal.

The Gorilla is the largest, strongest, and most formidable of the Primates. An adult male is from 5 feet 8 inches to 6 feet high, heavily built, with arms and chest of extraordinary power. The arms reach to the middle of the legs. The hands are clumsy, the thumb short, and the fingers joined by a web. The neck scarcely exists. The leg has a slight calf. The toes are stumpy and thick; the great toe moves like a thumb. The head is large and receding, with enormous ridges above the eyes, which give it a diabolical appearance. The canine teeth are developed into huge tusks. The nose has a long bridge, and the nostrils look downward. The ear is small and man-like.

Gorillas live mainly in the trees on whose fruit they subsist; they construct a shelter in the lower boughs for the family, and as a lying-in place for the female. The male is said to sleep below, with his back against the tree—a favorite attitude with both sexes—to keep off leopards. On the ground it moves on all-fours, with a curious swinging action, caused by putting its hands with fingers extended on the ground, and bringing its body forward by a half-jump. Having a heel, it can stand better than other apes; but this attitude is not common, and Du Chaillu appears to have been mistaken when he describes the Gorilla as attacking upright.

Courtesy of the New York Zoölogical Society

GORILLA

FROM A PHOTOGRAPH BY E. R. SANBORN

The Orang-utan

This great red ape was mentioned by Linnæus in 1766, and at the beginning of the last century a specimen living in the Prince of Orange's collection was described by Vosmaer.

There are three varieties of the Orang, called by the Dyaks Mias-pappan, Mias-rambi, and Mias-kassu, the third of which is smaller, has no cheek-excrescences, and very large teeth. Some naturalists recognize a pale and a dark race.

Most of our information is due to Raja Brooke and Dr. Wallace. The species is confined to Borneo and Sumatra, but fossils have been found in India of this genus, as well as of Chimpanzee. The Orang is less manlike than the Chimpanzee and Gorilla. In height the male varies from 3 feet 10 inches to 4 feet 6 inches, the female being a few inches shorter. It is a heavy creature, with large head—often a foot in breadth—thick neck, powerful arms, which reach nearly to the ankles, and protuberant abdomen. Its legs are short and bowed. The forehead is high, the nose fairly large, the ears very human. The throat is ornamented with large pouches, and there are often callosities on the cheeks. The fingers are webbed, the thumb small, the foot long and narrow, the great toe small and often without a nail. The brain is manlike, and the ribs agree in number with those of man; but there are nine bones in the wrist, whereas man, the Gorilla, and the Chimpanzee have but eight. The canine teeth are enormous in the male. The hair is yellowish-red: there is a slight beard. The skin is gray or brown, and often, in adults, black.

The Orang is entirely a tree-living animal, and is only found in moist districts where there is much forest. On the ground it progresses clumsily on all-fours, using its arms as crutches, and with the side only of its feet on the ground. In trees it travels deliberately but with perfect ease, swinging along underneath the branches, although it also walks along them semi-erect. It lives alone with mate and young, and builds a sleeping place sufficiently low to avoid the wind. Its food is leaves and fruit, especially the durian; its feeding-time, midday.

ORANG-UTAN—THE MAN OF THE WOODS

FROM A HABITAT GROUP IN THE AMERICAN MUSEUM OF NATURAL HISTORY

The Gibbons

Next after the great apes in man-like characters come a few long-armed, tailless apes, known as the Gibbons. Like the Orang-utan, they live in the great tropical forests of Asia, especially the Indian Archipelago; like the latter, they are gentle, affectionate creatures;

and they have also a natural affection for man. But it is in mind and temperament, rather than in skeleton, that the links and differences between men and monkeys must be sought. It will be found that these forest apes differ from other animals and from the true monkeys mainly in this—that they are predisposed to be friendly to man and to obey him, and that they have no bias toward mischief, or "monkey tricks." They are thoughtful, well behaved, and sedate.

Courtesy of the New York Zoölogical Society

GIBBONS MONKEY

FROM A PHOTOGRAPH BY E. R. SANBORN

The Dog-Shaped Monkeys

After the Gibbons come a vast number of monkeys of every conceivable size, shape, and variety, which naturalists have arranged in consecutive order with fair success. Until we reach the Baboons, and go on to the South American Monkeys and the Lemurs, it is not easy to give any idea of what these monkeys do or look like merely by referring to their scientific groups. The usual order of natural histories will here be followed, and the descriptions will, so far as possible, present the habits and appearance of the monkeys specially noticed.

This great family of true monkeys contains the Sacred Monkeys, or Langurs, of India, the Guerezas and Guenons of Africa, the Mangabeys, Macaques, and Baboons. Most of them have naked, hard patches of skin on the hindquarters, and the partition between the nostrils is narrow. Some have tails, some none, and they exhibit the most astonishing differences of size and shape. Perhaps the most grotesque and astonishing of them all is the Proboscis Monkey. It is allied to the Langurs, and is a native of the island of Borneo, to which it is confined; its home is the west bank of the Sarawak River. It is an arboreal creature, living in small companies.

The various Sacred Monkeys of India are often seen in this country, and are quite representative of the "miscellaneous" monkeys in general.

The Entellus Monkey is the most sacred of all in India. It is gray above and nutty-brown below, long-legged and active, a thief and an impudent robber. In one of the Indian cities they became such a nuisance that the faithful determined to catch and send away some hundreds. This was done, and the holy monkeys were deported in covered carts, and released many miles off. But the monkeys were too clever. Having thoroughly enjoyed their ride, they all refused to part with the carts, and hopping and grimacing, came leaping all the way back beside them to the city, grateful for their outing.

This is not the monkey commonly seen in the hills and at Simla. The large long-tailed monkey there is the Himalayan Langur, one of the common animals of the hills. "The Langur," says Mr. Lockwood Kipling in his "Beast and Man in India," "is, in his way, a king of the jungle, nor is he often met with in captivity. In some parts of India troops of Langurs come bounding with a mighty air of interest and curiosity to look at passing trains, their long tails lifted like notes of interrogation; but frequently, when fairly perched on a wall or tree alongside, they seem to forget all about it, and avert their heads with an affectation of languid indifference."

From India to Ceylon is no great way, yet in the latter island different Monkeys are found. The two best known are the White-bearded Wanderoo Monkey and the Great Wanderoo. Both are grave, well-behaved monkeys. The former has white whiskers and a white beard, and looks so wise he is called in Latin *Nestor*, after the ancient counsellor of the Greeks. Nice, clean little monkeys are these, and pretty pets. The Great Wanderoo is rarer. It lives in the hills.

THE GUEREZAS AND GUENONS

AMONG the ordinary Monkeys of the Old World are some with very striking hair and colors. The Guereza of Abyssinia has bright white-and-black fur, with long white fringes on the sides. This is the black-and-white skin fastened by the Abyssinians to their shields, and, if we are not wrong, by the Kafirs also. Among the Guenons, a large tribe of monkeys living in the African forests, many of which find their way here as "organ monkeys," is the Diana, a most beautiful creature, living on the Guinea Coast. It has a white crescent on its forehead, bluish-gray fur, a white beard, and a patch of brilliant chestnut on the back, the belly white and orange.

THE MACAQUES

THE Macaques, of which there are many kinds, from the Rock of Gibraltar to far Japan, occupy the catalogue between the Guenon and the Baboon. The Common Macaque and many others have tails.

Those of Japan, and some of those of China, notably the Tcheli Monkey and the Japanese Macaque, are tailless, and much more like anthropoid apes. The Tcheli Monkey is large and powerful, but other Macaques are of all sizes down to little creatures no bigger than a kitten. Some live in the hottest plains, others in the mountains. The Common Macaque, found in the Malay Archipelago, is a strong, medium-sized monkey. The Formosan Macaque is a rock-living creature; those of Japan inhabit the pine-groves, and are fond of pelting with stones and fir-cones anyone who passes. The Bonnet Macaque is an amusing little beast, very fond of hugging and nursing others in captivity. The Bandar or Rhesus Monkey, a common species, also belongs to this group. But the most interesting to Europeans is the Magot, or Barbary Ape. It is the last monkey left in Europe. There it only lives on the Rock of Gibraltar. It was the monkey which Galen is said to have dissected, because he was not permitted to dissect a human body. These monkeys are carefully preserved upon the Rock.

Courtesy of the New York Zoölogical Society

CURIOSITY—MACAQUE EXAMINING A CAMERA

FROM A PHOTOGRAPH BY E. R. SANBORN

Courtesy of the New York Zoölogical Society

MACAQUE

FROM A PHOTOGRAPH BY E. R. SANBORN

The Baboons

Far the most interesting of the apes in the wild state are the Baboons. Their dog-like heads (which in some are so large and hideous that they look like a cross between an ill-tempered dog and a pig), short bodies, enormously strong arms, and loud barking cry distinguish them from all other creatures. The greater number—for there are many kinds—live in the hot, dry, stony parts of Africa. They are familiar figures from the cliffs of Abyssinia to the Cape, where their bold and predatory bands still occupy Table Mountain. They are almost the only animals which the high-contracting Powers of Africa have resolved not to protect at any season, so mischievous are they to crops, and recently to the flocks. They kill the suckling lambs, and tear them to pieces for the sake of the milk contained in their bodies.

Courtesy of the New York Zoölogical Society

BABOON

FROM A PHOTOGRAPH BY E. R. SANBORN

One of the best-known Baboons is the Chacma of South Africa. The old males grow to great size, and are most formidable creatures. The Chacmas have for relations a number of other Baboons in the rocky parts of the African Continent, most of which have almost the same habits, and are not very different in appearance. Among them is the Gelada Baboon, a species very common in the rocky highlands of Abyssinia; another is the Anubis Baboon of the West Coast of Africa. The latter is numerous round the Portuguese settlement of Angola.

Equally strong and far more repulsive are the two Baboons of West Africa—the Drill and the Mandrill. As young specimens of these beasts are the only ones at all easily caught, and these nearly always die when cutting their second teeth when in captivity, large adult Mandrills are seldom seen in zoos. They grow to a great size, and are probably the most hideous of all beasts. The frightful nose, high cheek bones, and pig-like eyes are the basis of the horrible heads of devils and goblins which Albert Dürer and other German or Dutch mediæval painters sometimes put on canvas.

The American Monkeys

Mention of the Capuchins takes us to the whole group of the American Monkeys. Nearly all of these live in the tropical forests of Brazil, Guiana, Venezuela, and Mexico. They are all different from the Old World Monkeys, and many are far more beautiful. The most attractive of the hardier kinds are the Capuchins; but there are many kinds of rare and delicate little Monkeys more beautiful than any Squirrel, which would make the most delightful pets in the world, if they were not so delicate. To try to describe the Old World Monkeys in separate groups from end to end is rather a hopeless task. But the American Monkeys are more manageable by the puzzled amateur. Most of them have a broad and marked division between the nostrils, which are not mere slits close together, but like the nostrils of men. They also have human-looking rounded heads. Their noses are of the "cogitative" order, instead of being snouts or snubs with narrow openings in them; and the whole face is in many ways human and intelligent. The Howler Monkeys, which utter the most hideous sounds ever heard in the forests, and the Spider Monkeys are the largest. The latter have the most wonderfully developed limbs and tails for catching and climbing of any living animals.

The Capuchins are, in the writer's opinion, the nicest of all monkeys. Many species are known, but all have the same round, merry faces, bright eyes, pretty fur, and long tails. The greater number of these come from tropical America. There, in the mighty forests, so lofty that no man can climb the trees, so dense that there is a kind of upper storey on the interlaced tree-tops, the exquisite Marmosets, whose fur looks like the plumage and whose twittering voices imitate the notes of birds, live and have their being. They are all much alike in shape, except that the Lion Marmoset's mane is like that of a little lion clad in floss silk; and they all have sharp little claws, and feed on insects. The Pinché Marmoset from the Guiana forests has a face like a black Indian chief, with white plumes over his head and neck like those worn by a "brave" in full war paint.

THE ELEPHANT

By F. C. Selous

At once the mightiest and most majestic of all land mammals, the Elephant appeals to the imagination more forcibly than any other living animal not only on account of its great sagacity and the strangeness and singularity of its outward appearance but also because it is such an obvious link between the world of to-day and the dim and distant past of Pleiocene and Miocene times.

There are two existing species of Elephant, the African and the Asiatic, the latter, from the structure of its molar teeth and the shape of its skull, appearing to be very nearly related to the Mammoth, which lived upon the earth in comparatively recent times—geologically speaking—and was undoubtedly contemporary with man in Europe during the Stone Age.

Courtesy of the New York Zoölogical Society

ELEPHANT

FROM A PHOTOGRAPH BY E. R. SANBORN

There are very considerable differences both in the appearance and also in the habits of the two existing forms of Elephant. In the African species the forehead is more convex and the eye relatively larger than in its Asiatic cousin; and whilst the ears of the latter are only of moderate size, those of the former are so large that they at once arrest the attention, and are one of that animal's most remarkable characteristics. Both sexes of the African species, with few exceptions, carry well-developed tusks, but in the Asiatic form the tusks of the females are so small as scarcely to protrude beyond the jaws. In Asia, too, tuskless bull Elephants are common, while males of the African species without tusks are extremely rare. The latter species has but three nails on the hind foot, the Asiatic Elephant four. In the

African species the middle of the back is hollowed, the shoulder being the highest point, whilst in the Asiatic Elephant the back is arched, and the top of the shoulder lower than the highest part of the back. The tip of the trunk is also different in the two species, the African Elephant being furnished with two nearly equal-sized projections, the one on the front, the other in the hinder margin, with which small objects can be grasped as with the finger and thumb of the human hand, whilst in the Asiatic species the finger-like process on the upper margin of the end of the trunk is considerably longer than that on the under-side. In external appearance the skin of the African Elephant is darker in color and rougher in texture than that of the Asiatic form. The molar teeth of the former animal are, too, of much coarser construction, with fewer and larger plates and thicker enamel than the latter, which would naturally lead one to suppose that the African Elephant is accustomed to eat coarser, harder food than the Asiatic species. This supposition is borne out by fact; for whilst the Asiatic Elephant feeds mainly upon grass, the leaves and fruit of the wild plantain, and the young shoots of the bamboo, together with the leaves, twigs, and bark of certain trees, the African species never eats grass, and, although very fond of certain kinds of soft and succulent food, such as wild fruits and the inner bark of certain trees, is constantly engaged in chewing up the roots and branches of trees as thick as a man's wrist for the sake of the sap and bark, the woody portions being rejected after having been reduced to pulp. The Asiatic Elephant appears to be far less tolerant of exposure to the heat of the sun than the African; and whilst the latter may often be found standing at rest or sleeping throughout the hottest hours of the day in long grass or scrubby bush of a height not sufficient to afford any protection from the sun to the whole of the upper portion of the head and body, the former, when in a wild state, is said to always seek the shade of the densest forests it can find during hot weather.

The Asiatic Elephant often lies down when resting and sleeping. This is in marked contrast to the African species, which, if it ever does lie down at all, except to roll in mud or rub itself against an ant-heap, can only do so very rarely, since in all my experience, though I have seen some thousands of African Elephants standing sleeping during the heat of the day, I have never yet seen one of these animals lying down, nor found the impress in the ground where one had been so lying.

When excited and charging, both species of Elephant raise their heads and cock their ears, which in the African animal stand out at such a time like two sails, and, being each upward of 3½ feet in breadth, cover, together with the animal's head, an expanse of fully 10 feet. The Asiatic Elephant is said to remain mute whilst charging, and to hold its trunk tightly curled up between its tusks. The African Elephant, on the other hand, usually accompanies a charge with a constant succession of short, sharp trumpeting screams. Sometimes, though rarely, however, animals of this species remain mute whilst charging, but they never, I believe, coil their trunks up under their throats. Often an African Elephant will swing round for a charge with a loud scream and trunk held high in the air; but in my experience, when settling down to a chase, it drops its trunk and holds it pointing straight down in front of its chest.

As might be expected from the greater length of its legs, and consequent longer stride, the African Elephant is admitted by those who have had experience of both species to be a more active animal than its Asiatic cousin. Speaking of the walking and running powers of the Indian Elephant, that great authority Mr. Sanderson says that "the only pace of the elephant is the walk, capable of being increased to a fast shuffle of about fifteen miles an hour for very short distances. It can neither trot, canter, nor gallop. It does not move with the legs on the same side, but nearly so. A very good runner might keep out of an Elephant's way on a smooth piece of turf, but on the ground in which they are generally met with any attempt to escape by flight, unless supplemented by concealment, would be unavailing." This description exactly coincides with my own experience of the African Elephant, except that I think that animals of the latter species, especially cows and young bulls, are capable of getting up a pace of at least twenty miles an hour, and keeping it up for 100 to 200 yards, when charging.

In disposition both African and Asiatic Elephants are as a rule timid animals, and, excepting in the case of males of the latter species during the mating season, are always inclined to shun danger. I have never heard of male Elephants of the African species becoming savage and aggressive at any season of the year; indeed, old bulls always appeared to me to be less inclined to charge than cows or young bulls. The eyesight of the Elephant—of the African species at least—is bad, and his hearing not particularly acute; but the ability to smell probably is more highly developed than in any other animal, and, aided by this exquisite sense of smell, he will avoid a human being if possible. But if Elephants are attacked and wounded, they become savage and dangerous animals; and the charge of an African Elephant, coming on with the great ears outspread, to the accompaniment of a quick succession of short, sharp trumpeting screams, besides being very sudden and rapid, is very disconcerting to the nerves of a man unaccustomed to such experiences.

The strength of the Elephant is proverbial; and in India and Burma, where this animal has for ages past been trained in the service of man, this power is habitually made use of in moving and stacking large baulks of timber, or in dragging heavy guns through muddy ground or up steep ascents. In Africa the traveler is often astonished at the size of trees which have been uprooted and overturned by Elephants. These trees, however, have no taproot, and have not therefore a very firm hold in the ground, especially during the rainy season, when the ground is soft. At this time of year large trees are batted down by Elephants, which push against their stems with the thick part of their trunks, and get them on the swing, until the roots become loosened and the trees are at last overturned. Small trees of 2 or 3 inches in diameter, as well as branches, they break off with their trunks.

The Elephant is a very slow-going and long-lived animal, not arriving at maturity until upward of thirty years of age; and since cases are on record of Elephants having lived for upward of 130 years in captivity in India, it is probable that in a wild state these animals, both in Asia and Africa, often attain to an age of 150 years. The female Elephant produces, as a rule, but one calf at birth, the period of gestation lasting from eighteen to nearly twenty-two months. The mammæ of the cow Elephant are placed between the forelegs, and the new-born calf sucks with its mouth, holding its trunk turned back over its head. I have seen Elephant calves so engaged.

Although there is no reason to doubt that the African Elephant is as intelligent as the Asiatic species, its domestication has never been attempted by the Negro or Bantu races of Africa. It is believed that the African Elephant was in ancient times domesticated by the Carthaginians, and used by them in their wars with the Romans.

THE RHINOCEROS

By F. C. Selous

Of the five existing species of Rhinoceros, three are found in Asia, whilst two are inhabitants of Africa.

Of the three Asiatic species, two, the Indian and the Javan, are one-horned, and have a single pair of broad incisor teeth in the upper jaw, and a pair of sharp-edged and pointed tusks in the lower, the nasal bones being long and narrow, and terminating in a point. In both these species the skin is hairless (except for tufts or fringes at the extremity of the tail and on the edges of the ears), and is arranged in shield-like folds over the body. The arrangement of these folds, however, differs somewhat in the two species, and the large round tubercles with which the skin of the great Indian Rhinoceros is profusely studded are wanting in the Javan species.

Courtesy of the New York Zoölogical Society

RHINOCEROS

FROM A PHOTOGRAPH BY E. R. SANBORN

The Indian Rhinoceros inhabits the Terai at the foot of the Himalaya from Bhutan to Nepal, and is said to be very abundant in Assam and the Bhutan Dooars. It frequents swampy ground, and lives amongst jungles and dense growths of reeds and grass, which attain a height sometimes of 20 feet, and cover vast areas of ground in the valley of the Brahmaputra and the other rivers.

Owing to the nature of the country in which it lives, the Indian Rhinoceros cannot often be hunted with much prospect of success, except with the aid of elephants, which sagacious animals are not only employed to carry the hunters, but are also used to beat the great grass jungles in which the Rhinoceroses lie hidden, and drive them toward the guns.

Despite its great size and strength, the Indian Rhinoceros seems to be regarded as, in general, a timid and inoffensive animal, and even when wounded it seldom charges home. Elephants, however, appear to be as a rule nervous when in the near proximity of Rhinoceroses, perhaps objecting to the smell of those animals. When the Indian Rhinoceros does make good its charge against either man or Elephant, it cuts and rips its enemy with its teeth, and makes little use of its horn as an offensive weapon.

Large males of this species will stand from 5 feet 9 inches to 6 feet at the shoulder, and they are enormously bulky. Both sexes carry well-developed horns, which, however, do not usually attain a length of upward of 12 inches. There is a specimen in the British Museum measuring 19 inches, and it is believed that in very exceptional instances a length of 2 feet has been attained.

The Javan Rhinoceros, though it has been called the Lesser Indian Rhinoceros, is said by a late authority—Mr. C. E. M. Russell—to stand about the same height at the shoulders as the Indian species. It is found in the Sunderbunds of Eastern Bengal, and has been met with in the Sikhim Terai and in Assam, ranging eastward through Burma and the Malay Peninsula to Sumatra, Java, and Borneo.

But little appears to be known of the habits of this species of Rhinoceros. Although it is found in the swampy grass-covered plains of the Sunderbunds, its more usual habitat seems to be hilly forest-covered country, and both in Burma and Java it ascends to a height of several thousand feet above sea level. It feeds principally upon leaves and the young shoots of trees and bushes. In disposition it is timid and inoffensive. Only the male carries a horn, which, being very short, is a very poor trophy for a sportsman.

The third Asiatic species of Rhinoceros, known as the Sumatran, is the smallest of all living Rhinoceroses. This species carries two horns, and its skin, which is very rough, is usually thinly covered with hair of a dark brown color and of considerable length. The folds in the skin of the Sumatran Rhinoceros are not nearly so well developed as in its single-horned relative, and the one behind the shoulder is alone continued over the back. Although furnished with tusks in the lower jaw, the small pair of incisor teeth, which in the other two Asiatic Rhinoceroses are always present in front of these tusks, are wanting in the Sumatran species.

The Sumatran Rhinoceros is rare in Assam, but is found in Burma and the Malay Peninsula, as well as in Siam, Sumatra, and Borneo. The two horns of this species are placed at some distance apart. Although they are as a rule very short, the front horn occasionally grows to a considerable length, sweeping backward in a graceful curve.

In height adult males of the Sumatran species stand on the average from 4 feet to 4½ feet at the shoulder, and females sometimes not more than 3 feet 8 inches.

Of the two African species, the White or Square-mouthed Rhinoceros is the larger and the rarer. Until quite recently the range of this huge ungainly-looking animal, the biggest of all terrestrial mammals after the Elephant, was supposed to be entirely confined to the southern portions of the African Continent; for although from time to time horns had found their way to Zanzibar which seemed referable to the Square-mouthed Rhinoceros, the fact of the existence of the white Rhinoceros in any part of Africa north of the Zambesi remained in doubt until a female was shot in the year 1900, in the neighborhood of Lado, on the Upper Nile, by Captain A. St. H. Gibbons, who brought its skin, skull, and horns to England. The fact, however, that the white Rhinoceros has never been encountered by any other traveler in central Africa seems to show that the animal is either very rare in those districts, or that it has an exceedingly limited range.

The white Rhinoceros lived in families, usually a bull, cow, and calf being found together; but there might be two or even three calves of different ages, and of which the youngest alone would be suckling, living with the father and mother. In the early South African spring (September and October), when the young green herbage was just sprouting after the first rains, two or three families of white Rhinoceroses might be seen feeding in close proximity, presenting the appearance of a herd; but I fancy the several families of these animals had only been brought together for the sake of the young green grass. In southern Africa the white Rhinoceros lived entirely on grass, and I have never seen any evidence of their having eaten anything else. When either walking, trotting, or galloping, the white Rhinoceros always carried its nose close to the ground. A calf always preceded its mother, and she appeared to guide it by holding the point of her horn on the little creature's rump; and in all changes of pace, no matter how sudden, this position was always maintained. The white Rhinoceros was easily killed by a shot through the heart or through both lungs, but would travel very long distances, and probably, as a rule, ultimately recover from wounds in other parts of the body. They could travel at a great rate and for a considerable distance with a broken foreleg or shoulder, but if a hind leg were broken they were rendered almost immediately helpless. In disposition they were sluggish and inoffensive animals, lying asleep in the shade of trees or bushes during the heat of the day, and coming to the water to drink at night or often before sundown in parts of the country where they had not been much molested. When disturbed, white Rhinoceroses would go off at a swift trot, but if chased on horseback would break into a gallop, which they were capable of maintaining for a considerable distance, and at a wonderful pace for so large and heavy an animal. The meat of the white Rhinoceros was most excellent, the part in greatest favor amongst hunters being the hump on the back of the neck in front of the shoulder, which was cut off whole and roasted in the skin in a hole dug in the ground. The so-called white Rhinoceros is dark gray in color.

The second species of African Rhinoceros, which is also dark gray in color, is known as the Black or Prehensile-lipped Rhinoceros.

Less than a hundred years ago the range of this fast-disappearing species extended from the northwestern districts of the Cape Colony to Abyssinia, and at that time it must have been plentiful over almost the whole of the intervening country. It never seems to have penetrated into the equatorial forest regions of west central Africa, where the climate is probably too damp to suit its requirements; for both species of African Rhinoceros appear to like a dry climate, and not to object to very arid surroundings. At the same time they never wander many miles from a river or pool, and drink regularly every night, and in hot weather probably very often a second time in the early morning.

In southern Africa the black Rhinoceros appears to attain to a larger size than in the countries farther north. To the south of the Zambesi large bulls of this species will stand 5 feet 8 inches at the shoulder; whilst the height of an adult bull, as taken by Mr. F. Jackson at Naivasha, in East Africa, was 5 feet 5 inches; and Mr. A. H. Neumann gives the standing height of another adult bull shot by himself still farther north, near Lake Rudolph, as only 4 feet 9 inches.

There has been a good deal of controversy as to the character and disposition of the black Rhinoceros, some hunters and travelers regarding it as most dangerous and aggressive, whilst others are inclined to take an almost opposite view. That some black Rhinoceroses are certainly aggressive and therefore dangerous animals, the experiences of C. J. Anderson and W. Cotton Oswell in South Africa many years ago, and of many travelers and hunters in East Africa during the last few years, certainly prove beyond a doubt; and as one never knows that any particular Rhinoceros, when encountered, may not prove to be a vicious brute, a certain amount of caution should be employed in approaching one of these animals. In my own experience I always found that black Rhinoceroses ran off at once on getting the wind of a human being; whilst, on the other hand, if they only heard one approaching, they would come toward the noise, and I have often known them to trot up snorting and puffing loudly, to within twenty yards of where I was standing; but as these animals always turned round and went off eventually without charging, I came to the conclusion that they were inquisitive and very shortsighted rather than vicious.

HIPPOPOTAMUS

By F. C. Selous

Two species of the Hippopotamus family exist on the earth to-day, both of which are inhabitants of Africa, and are not found in any other country; but the remains of many extinct forms of this genus which have been discovered in various parts of Europe and Asia show that in prehistoric times these strange and uncouth animals must have been widely distributed throughout the greater part of the Old World. The fossil remains of the large form of Hippopotamus which once frequented the lakes and rivers of England and Western Europe cannot be distinguished from the bones of the common African species of to-day, which latter is possibly the only animal in the world which has undergone no change in form or structure since the prehistoric savages of the Thames Valley threw stone-headed spears at their enemies.

Courtesy of American Museum of Natural History

HIPPOPOTAMUS

The Common Hippopotamus, though it has long been banished from the Lower Nile, and has more recently been practically exterminated in the British colonies south of the Limpopo, was once an inhabitant of every lake and river throughout the entire African Continent from the delta of the Nile to the neighborhood of Cape Town. Now it is not found below Khartoum, on the Nile; but in Southern Africa a few Hippopotamuses are said still to exist in the lower reaches of the Orange River. When Van Riebeck first landed at the Cape, in 1652, he found some of these animals in the swamp now occupied by Church Square, in the center of Cape Town, and the last in the district was killed in the Berg River, about seventy miles north of that city only as recently as 1874. This animal, which had been protected for some years, was at last shot, as it had become very savage, and was in the habit of attacking anyone who approached it. In my own experience I have met with the Hippopotamus in all the large rivers of Africa where I have traveled, such as the Zambesi, Kafukwe, Chobi, Sabi, Limpopo, and Usutu, and also in most of the many large streams which take their rise on the plateau of Matabililand and Mashonaland, and flow north, south, and east into the Zambesi, the Limpopo, or the Sabi. I have also seen them in the sea, at the mouth of the Quillimani River, and have heard from natives that they will travel by sea from the mouth of one river to another.

Hippopotamuses live either in families of a few individuals or in herds that may number from twenty to thirty members. Old bulls are often met with alone, and cows when about to calve will sometimes leave their companions and live for a time in seclusion, returning, however, to the herd soon after the birth of their calves. Although, owing to the shortness of its legs, a Hippopotamus bull does not stand very high at the shoulder—about 4 feet 8 inches being the average height—yet its body is of enormous bulk. A male which died some years ago in the Zoölogical Gardens of London measured 12 feet in length from the nose to the root of the tail, and weighed 4 tons: and these dimensions are probably often exceeded in a wild state.

The huge mouth of the Hippopotamus, which the animal is fond of opening to its widest extent, is furnished with very large canine and incisor teeth, which are kept sharp by constantly grinding one against another, and thus enable their possessor rapidly to cut down great quantities of coarse grass and reeds upon which these animals exclusively feed when living in uninhabited countries. When, however, their haunts are in the neighborhood of native villages, they often commit great havoc in the cornfields of the inhabitants, trampling down as much as they eat; and it was their fondness for sugar cane which brought about the destruction of the last herd of Hippopotamuses then surviving in Natal.

The lower canine teeth or tusks of the Hippopotamus grow to a great size, and in bulls may weigh from 4 lbs. to 7 lbs. each. They are curved in shape, and when extracted from the jaw form a complete half-circle, and have been known to measure upward of 30 inches over the curve. In life, however, not more than a third of their length protrudes beyond the gums.

During the daytime Hippopotamuses are seldom met with out of the water. They lie and doze all day long in the deep pools of the rivers they frequent, with only their eyes, ears, and nostrils above the surface, or else bask in the sun on the tail of a sand bank, looking like so many gigantic pigs with their bodies only partially submerged. Sometimes they will lie and sleep entirely out of the water amongst reeds. I have seen them feeding in the reed-beds of the great swamps of the Chobi just at sundown, but as a rule they do not leave the water until after dark. At night they wander often far afield, especially in the rainy season, in search of suitable food; and after having been fired at and frightened, I have known a herd of Hippopotamuses to travel at least five-and-twenty miles along the course of a river during the ensuing night, in order to reach a larger and deeper pool than the one in which they had been molested.

Although the Hippopotamus is thoroughly at home in the hottest parts of Africa, and appears to thrive in the tepid waters of all the rivers which flow through the malarious coast regions of the tropical portions of that continent, it is also found at a considerable altitude above the sea, and in quite small streams where the temperature of the water during the winter months cannot be many degrees above freezing point. I have personally met with Hippopotamuses in the Manyami River, not far from the present town of Salisbury, in Mashonaland. The country there has an altitude of about 5,000 feet above sea level; and the water was so cold on the last occasion on which I came across the animals in question—month of July—that, if a basinful was left out during the night, ice quite an eighth of an inch in thickness would be formed over it before morning. There was, however, never any ice on the river itself. During the rainy season, when the grass and reeds are green and succulent, Hippopotamuses become enormously fat, especially in the higher and colder portions of their range, and retain a good deal of their fat right through the driest season of the year. Old bulls are usually very lean; but I have seen cows the greater part of whose carcasses, after the skin had been stripped off, was covered with a layer of fat from 1 to 2 inches in thickness. The meat of these animals is dark red in color, and more like beef than pork. To my mind, that of a young animal is most excellent in flavor, and far preferable to that of a lean antelope. The fat, when prepared, is as good as the best lard, from which, indeed, it is hardly distinguishable. The skin of the Hippopotamus is smooth and hairless, and in adult animals quite 1½ inches in thickness on the upper parts of the body.

Hippopotamuses are said to be capable of remaining under water for ten or twelve minutes. Should, however, a herd of these animals be watched but not fired at from the bank of a river in which they are passing the day, they will all sink below the surface of the water as soon as they become aware of and more or less alarmed by the presence of the intruder, but each member of the herd will come up to breathe at intervals of from one to two minutes. I have seen Hippopotamuses so tame and unsuspicious of danger that they allowed me—the first human being probably with any kind of hat or clothes on him that they had ever seen—to take up a position within fifty yards of them on the edge of the deep rock-bound pool in which they were resting without showing any signs of alarm. They simply stared at me in an inquisitive sort of way, raising their heads higher out of the water, and constantly twitching their little rounded ears; and it was not until a number of natives came up and began to talk loudly that they took alarm, and, sinking out of sight, retreated to the farther end of the pool. I once took the length of time with my watch for more than an hour that a Hippopotamus which I was trying to shoot remained under water. This animal, a cow with a newborn calf, had made an attack upon one of my canoes. It first came up under the canoe, tilting one end of it into the air and almost filling it with water. Then it made a rush at the half-swamped craft, and, laying its huge head over it, pressed it down under water and sank it. There were four natives in the canoe at the time of the attack, all of whom swam safely to an island in the river—the Zambesi. After the accident—which caused me a good deal of loss and inconvenience—I tried to shoot this unprovoked aggressor, but unsuccessfully, as the river was too broad to allow me to get anything but a long shot at her. The shortest time she remained under water during the seventy minutes I was paying attention to her was forty seconds, and the longest four minutes and twenty seconds—the usual time being from two to two and a half minutes. She always remained a long time under water after having been fired at.

The capsizing of canoes by these animals is quite a common occurrence on most African rivers, and the great pains the natives will take in certain districts to give these animals a wide berth seem to prove that they have good reason to dread them. Solitary bulls and cows with young calves are the most feared. Such animals will sometimes, I have been assured by the natives, tear out the side of a canoe with their teeth, and even crunch up some of its occupants whilst they are trying to save themselves by swimming.

THE CAMEL

By W. P. Pycraft, A. L. S., F. Z. S.

The Camels and Llamas, constituting the present group, form a very distinct section of the great assemblage of animals known as the Ruminants, or Cud-chewers. The Camel Tribe are peculiar amongst the Ruminants in that they never possess horns, and in that the stomach is only divided into three instead of four compartments—this division into compartments being intimately connected with the ruminating habits. Furthermore, the upper jaw bears cutting-teeth, or "front teeth," as they are popularly called: though the full set (three pairs) is only complete in the young, in the adult but one pair remains, the others being shed. The canine or "eye" teeth are also peculiar in their position, those of the lower jaw being separated from the cutting-teeth by a very considerable gap.

In the structure of the feet the Camel Tribe are no less peculiar; indeed, it is on this character that the scientific name of the group is founded. Only two toes are present; these are of equal size, and, instead of being protected by hoofs, are provided with a hardened skin, covering a cushion-like pad, which expands when the weight of the body is thrown upon the foot, as in walking. This is an admirable adaptation for walking on soft and yielding sands. Hoofs are represented only by a pair of broad nails.

The three-chambered stomach is remarkable because the chamber known as the "paunch" lodges in its walls a large collection of "water-cells," in which can be stored as much as a gallon and a half of water. This faculty of storing water is invaluable to an animal which has often to subsist for days on absolutely waterless deserts.

The slit-like nostrils in the Bactrian Camel can be closed at the will of the animal—a useful precaution against the entrance of sand during the violent sand-storms which often arise in the desert.

The True Camels are distinguished by the possession of a hump or humps; there are never more than two. It is in these humps that the camel was popularly supposed to store water; in reality they are huge masses of fat, serving as a reserve store of food. The accumulation of fat for this purpose is a common feature amongst the Mammalia. Most animals which hibernate, or lap up and sleep during the winter, store up fat; but, except in the Camel, it is distributed more or less evenly over the body. With hard work or bad feeding the Camel's hump dwindles almost to nothing. When on the eve of a long journey, the Arab looks anxiously to the state of this hump, for on the size of this depends the animal's condition and ability to undertake the march.

Courtesy of the New York Zoölogical Society

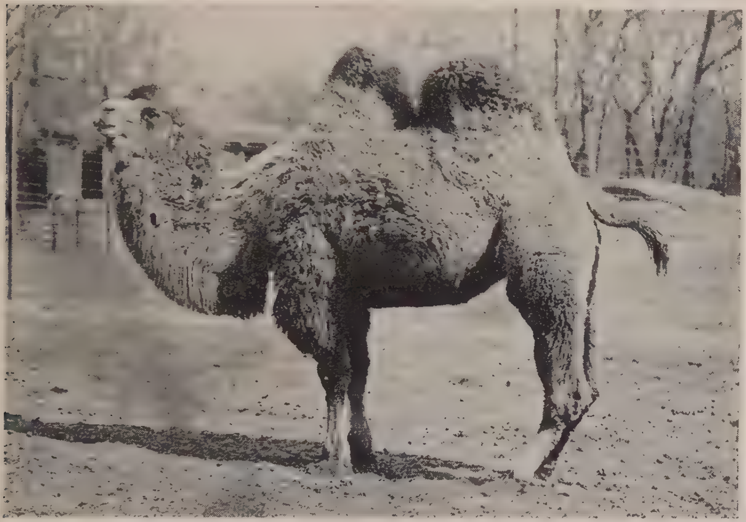
DROMEDARY CAMEL
FROM A PHOTOGRAPH BY E. R. SANBORN

THE TRUE CAMEL

Before proceeding further, it may be well to refer to the confusion which exists in the use of the names Camel and Dromedary. The latter name seems popularly to be applied to the two-humped species, the name Camel being reserved for the one with a single hump. This is a mistake. The Dromedary is a swift breed of Riding-camel of the one-humped species, and is so called to distinguish it from its slower brother, the Pack-camel, or Baggage-camel. The Pack-camel, it is interesting to note, has been introduced into Australia, where it has proved invaluable in crossing the vast waterless deserts, on account of its power to exist for long periods without drinking.

The True or Arabian Camel is found in a domesticated state in Africa and Asia, and, as we have indicated, belongs to the one-humped species. It is a long-limbed, short-haired animal, standing as much as 7 feet high. As a wild animal it is extinct. Much mystery, indeed, surrounds the question of its origin. It has been suggested that the Arabian Camel, or its immediate parent, may have sprung from an Indian ancestor, and thence made its way through Arabia and Syria into northern Africa.

Courtesy of the New York Zoölogical Society



BACTRIAN CAMEL
FROM A PHOTOGRAPH BY E. R. SANBORN

The Bactrian Camel

This species is often called the Dromedary; but, as we have already remarked, this is an error. The Dromedary is a swift breed of the Arabian Camel. The Bactrian Camel may be distinguished from its Arabian relative by the fact that it has two humps, is shorter in the leg and heavier, and has longer hair and stouter and harder feet. The shorter legs are distinctly advantageous, enabling the animal to get about with ease and perfect safety over rocky and hilly ground.

The hordes of wild Camels found in Turkestan, in the neighborhood of Kashgar, are believed by Major C. S. Cumberland to be descended from Camels which escaped when the district known as Takla-makan was buried in a great sand-storm 200 years ago. From the fury of that storm it is said no human being escaped alive. Some Camels apparently did, perhaps owing their survival to the power they possess of closing the nostrils, and thereby keeping out the sand.

The Bactrian Camel lives upon the salt and bitter plants of the steppes, which are rejected by almost all other animals. It is further able to drink brackish water from the salt lakes by which it is surrounded. When pressed by hunger, it will even eat felt blankets, bones and skins of other animals, and fish!

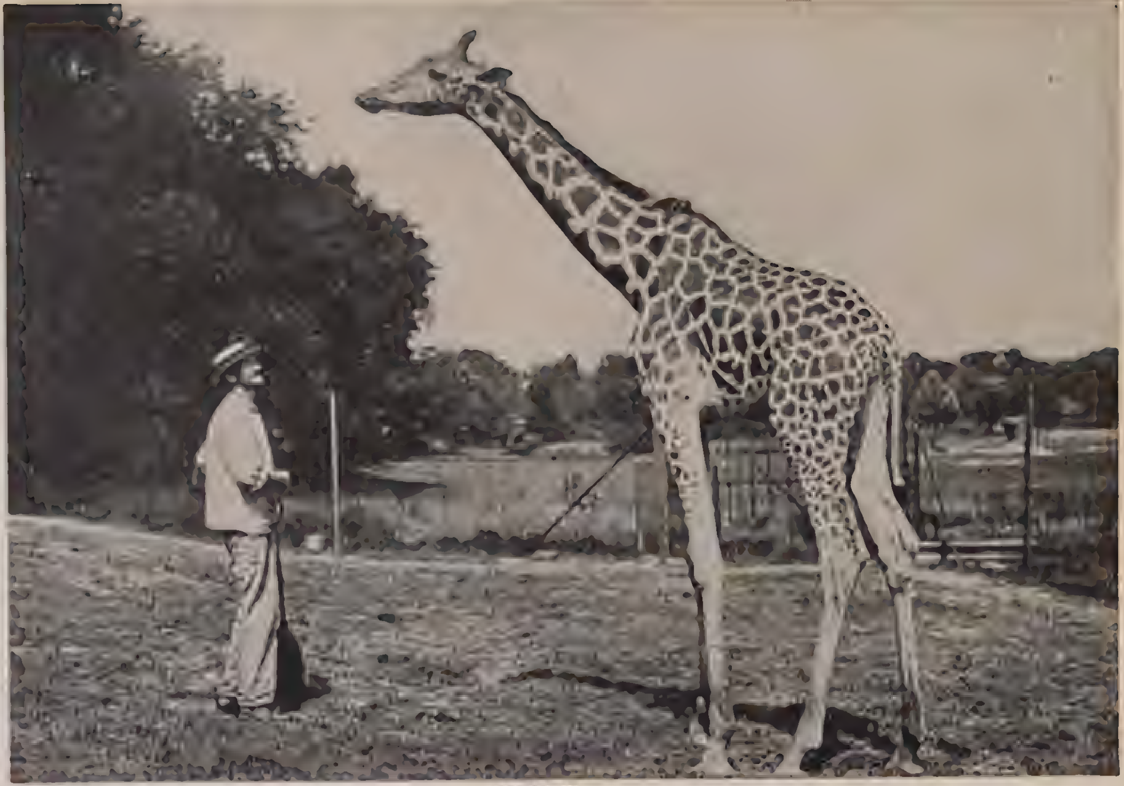
THE GIRAFFE

By H. A. Bryden

Giraffes, which are found only on the continent of Africa, are the tallest of all living creatures. They belong to the Ruminants, or Cud-chewers, and naturalists are inclined to place them somewhat between the Deer Family and the Hollow-horned Ruminants, in which latter are to be found oxen, buffaloes, and antelopes. Rütimeyer, the Swiss naturalist, once defined them as "a most fantastic form of deer," which is, perhaps, as good a definition of them as one is likely to hit upon. Fossil discoveries show that, in ages long remote, great giraffe-like creatures, some of them bearing horns or antlers, roamed widely in the south of Europe, Persia, India, and even China.

Of living Giraffes, two species have thus far been identified,—the Southern, or Cape Giraffe, with a range extending from Bechuanaland and the Transvaal to British East Africa and the Sudan; and the Nubian, or Northern Giraffe, found chiefly in East Africa, Somaliland, and the country between Abyssinia and the Nile. The Southern Giraffe, which is now the more familiar of the two animals, has a creamy or yellowish-white ground-color, marked by irregular blotches, which vary in color, in animals of different ages, from lemon-fawn to orange-tawny, and in older specimens to a very dark chestnut. Old bulls and occasionally old cows grow extremely dark with age, and at a distance appear almost black upon the back and shoulders. The Northern Giraffe is widely different, the coloration being usually a rich red-chestnut, darker with age, separated by a fine network of white

Courtesy of the New York Zoölogical Society



GIRAFFE

FROM A PHOTOGRAPH BY E. R. SANBORN

lines, symmetrically arranged in polygonal patterns. At no great distance this Giraffe, instead of having the blotchy or dappled appearance of the Southern Giraffe, looks almost entirely chestnut in color. Again, the Southern Giraffe has only two horns, while the Northern species usually develops a third, growing from the center of the forehead. These horns, which are covered with hair in both species, and tufted black at the tips, are, in the youthful days of the animal, actually separable from the bones of the head. As the animal arrives at maturity, they become firmly united to the skull. A third race or sub-species of Giraffe has been identified in Western Africa, mainly from the skull and cannon-bones of a specimen shot in 1897 at the junction of the Binue and Niger rivers; but very little is known about this form. Other varieties or sub-species may yet be discovered in other parts of the Dark Continent. It is lacking in the Giraffe's long neck.

The towering height of the Giraffe is entirely attributable to the great length of the neck and limbs. A full-grown bull Giraffe will certainly measure occasionally as much as 19 feet in height. I measured very carefully a specimen shot by my hunting friend, Mr. W. Dove, in the forests of the North Kalahari, South Africa, which taped 18 feet 11½ inches. A fine cow, shot by myself in the same country, measured 16 feet 10 inches, and there is no reason to suppose that cow Giraffes do not easily reach fully 17 feet in height. These animals feed almost entirely upon the leaves of acacia-trees, the foliage of the *kameeldoorn*, or giraffe-acacia, affording their most favorite food-supply. It is a most beautiful spectacle to see, as I have seen, a large troop of these dappled giants—creatures which, somehow, viewed in the wild state, always seem to me to belong to another epoch—quietly browsing, with upstretched necks and delicate heads, among the branches of the spreading *mokala*, as the Bechuanas call this tree.

The Giraffe's upper lip is long and prehensile, and covered, no doubt as a protection against thorns, with a thick velvety coating of short hair. The tongue is long—some 18 inches in length—and is employed for plucking down the tender leafage on which the Giraffe feeds. The eyes of the Giraffe are most beautiful—dark brown, shaded by long lashes, and peculiarly tender and melting in expression. Singularly enough, the animal is absolutely mute, and never, even in its death-agonies, utters a sound. The hoofs are large, elongate, nearly 12 inches in length in the case of old bulls, and look like those of gigantic cattle. There are no false hoofs, and the fetlock is round and smooth. The skin of a full-grown Giraffe is extraordinarily tough and solid, attaining in the case of old males as much as an inch in thickness.

From these animals most of the *sjamboks*, or colonial whips, in use all over South Africa, are now made; and it is a miserable fact to record that Giraffes are now slaughtered by native and Boer hunters almost solely for the value of the hide, which is worth from £3 to £5 in the case of full-grown beasts. So perishes the Giraffe from South Africa.

THE AFRICAN LION

By F. C. Selous

When, in the latter half of the seventeenth century, Europeans first settled at the Cape of Good Hope, the Lion's roar was probably to be heard almost nightly on the slopes of Table Mountain, since a quaint entry in the Diary of Van Riebeck, the first Dutch governor of the Cape, runs thus: "This night the Lions roared as if they would take the fort by storm"—the said fort being situated on the site of the city now known as Cape Town.

At that date there can be little doubt that, excepting in the waterless deserts and the dense forests near the equator, Lions roamed over the whole of the vast continent of Africa from Cape Agulhas to the very shore of the Mediterranean Sea; nor was their range very seriously reduced until the spread of European settlements in North and South Africa, and the acquisition of firearms by the native inhabitants of many parts of the country, during the latter half of the nineteenth century, steadily denuded large areas of all wild game.

As the game vanished, the Lions disappeared too; for although at first they preyed to a large extent on the domestic flocks and herds which gradually replaced the wild animals of the once-uninhabited plains, this practice brought them into conflict with the white colonists or native herdsmen armed with weapons of precision, before whom they rapidly succumbed.

To-day Lions are still to be found wherever game exists in any quantity, and their numbers will be in proportion to those of the wild animals on which they prey.

The indefinite increase of Lions must be checked by some unknown law of nature, otherwise they would have become so numerous in the thinly inhabited or altogether uninhabited parts of Africa, that they would first have exterminated all the game on which they had been wont to prey, and would then have had to starve or to have eaten one another. But such a state of things has never been known to occur; and whenever Europeans have entered a previously unexplored and uninhabited tract of country in Africa, and have found it teeming with buffaloes, zebras, and antelopes, they have always found Lions in such districts very plentiful indeed, but never in such numbers as to seriously diminish the abundance of the game upon which they depended for food.

It is easy to understand that the increase of a herd of grazing animals would be regulated by the amount of the food-supply available, as well as constantly checked by the attacks of the large carnivora, such as Lions, Leopards, Cheetas, Hyenas, and Wild Dogs; but I have never been able to comprehend what has kept within bounds the inordinate increase of Lions and other carnivorous animals in countries where for ages past they have had an abundant food-supply, and at the same time, having been almost entirely unmolested by human beings, have had no enemies. Perhaps such a state of things does not exist now, but there are many parts of Africa where such conditions have existed from time immemorial up to within quite recent years.

Courtesy of the New York Zoölogical Society

LION

FROM A PHOTOGRAPH BY E. R. SANBORN

Since Lions were once to be found over the greater portion of the vast continent of Africa, it is self-evident that these animals are able to accommodate themselves to great variations of climate and surroundings; and I myself have met with them, close to the sea, in the hot and sultry coastlands of Southeast Africa; on the high plateau of Mashonaland, where at an altitude of 6,000 feet above sea level winter nights are cold and frosty; amongst the stony hills to the east of the Victoria Falls of the Zambesi; and in the swamps of the Chobi. In the great reed-beds of the latter river a certain number of Lions appeared to live constantly, preying on Buffaloes and Lechwe Antelopes. I often heard them roaring at nights in these swamps, and I once saw two big male Lions wading slowly across an open space between two beds of reeds in water nearly a foot in depth.

Although there are great individual differences in Lions as regards size, general color of coat, and more particularly in the length, color, and profuseness of the mane with which the males are adorned, yet as these differences occur in every part of Africa where Lions are met with, and since constant varieties with one fixed type of mane living by themselves and not interbreeding with other varieties do not exist anywhere, modern zoölogists are, I think, now agreed that there is only one species of Lion, since in any large series of wild-Lion skins, made in any particular district of Africa or Asia, every gradation will be found between the finest-maned specimens and those which are maneless.

In the hot and steamy coastlands of tropical Africa, Lions usually have short manes, and never, I believe, attain the long silky black manes sometimes met with on the high plateaus of the interior. However, there is, I believe, no part of Africa where all or even the majority of male Lions carry heavy manes, the long hair of which does not as a rule cover more than the neck and chest, with a tag of varying length and thickness extending from the back of the neck to between the shoulder-blades. Lions with very full black manes, covering the whole shoulders, are rare anywhere, but more likely to be encountered on the high plateaus, where the winter nights are extremely cold, than anywhere else.

THE TIGER

Tigers are the "type animal" of Asia. They are found nowhere else. Lions were inhabitants, even in historic times, of Europe, and are still common on the Euphrates and in parts of Persia, just as they were when the Assyrian Kings shot them with arrows from their hunting-chariots. They survived in Greece far later than the days when story says that Hercules slew the Nemean Lion in the Peloponnesus, for the baggage-animals of Xerxes' army of invasion were attacked by Lions near Mount Athos. But the Tiger never comes, and never did come in historic times, nearer to Europe than the Caucasian side of the Caspian Sea. On the other hand, they range very far north. All our Tiger-lore is Indian. There is scarcely a story of Tigers to be found in English books of sport which deal with the animal north of the line of the Himalaya. These Chinese northern Tigers and the Siberian Tigers are far larger than those of India. They have long woolly coats, in order to resist the cold. Their skins are brought to market in hundreds every year to the great fur-sales. But the animals themselves we never see. The writer was informed by a friend that in the Amur Valley he shot three of these Tigers in a day, putting them up in thick bush-scrub by the aid of dogs.

Courtesy of the New York Zoölogical Society

TIGER

FROM A PHOTOGRAPH BY E. R. SANBORN

The Royal Bengal Tiger, so called, and very properly called in the old books of natural history, is a different and far more savage beast. It is almost *invariably* a ferocious savage, fierce by nature, never wishing to be otherwise than a destroyer—of beasts mainly, but often of men. Compared with the Lion, it is far longer, but rather lighter, for the Lion is more massive and compact. "A well-grown Tigress," says Sir Samuel Baker, "may weigh on an average 240 lbs. live weight. A very fine Tiger may weigh 440 lbs., but if fat the same Tiger would weigh 500 lbs. There may be Tigers which weigh 50 lbs. more than this; but I speak according to my experience. I have found that a Tiger of 9 feet 8 inches is about 2 inches above the average. The same skin may be *stretched* to measure 10 feet. A Tiger in the Zoölogical Gardens is a long, lithe creature with little flesh. Such a specimen affords a poor example of this grand animal in its native jungles, with muscles in their full, ponderous development from continual exertion in nightly travels over long distances, and in mortal struggles when wrestling with its prey. A well-fed Tiger is by no means a slim figure. On the contrary, it is exceedingly bulky, broad in the shoulders, back, and loins, and with an extraordinary girth of limbs, especially in the forearms and wrists."

This ponderous, active, and formidably armed creature is, as might be expected, able to hold its own wherever Europeans do not form part of the regular population. In India the peasants are quite helpless even against a cattle-killing Tiger in a populous part of the country. In the large jungles, and on the islands at the mouths of the great rivers, the Tigers have things all their own way. Things are no better in the Far East. A large peninsula near Singapore is said to have been almost abandoned by its cultivators lately, owing to the loss of life caused by the Tigers. In the populous parts of India the Tiger is far more stealthy than in the out-of-the-way districts. It hunts only by night; and after eating a part of the animal killed, moves off to a distance, and does not return. Otherwise the regular habit is to return to the kill just at or after dusk, and finish the remainder. Its suspicions seem quite lulled to sleep after dark. Quite recently a sportsman sat up to watch for a Tiger at a water hole. It was in the height of the Indian hot season, when very little water was left. All the creatures of that particular neighborhood were in the habit of coming to drink at one good pool still left in the rocky bed of the river. There the Tigers came too. The first night they did not come until all the other creatures—hogs, deer, peacocks, and monkeys—had been down to drink. They then came so softly over the sand that the gunner in waiting did not hear them pass. His first knowledge that they were there was due to the splashing they made as they entered the water. It was quite dark, and he felt not a little nervous, for the bush on which he was seated on a small platform was only some 10 feet high. He heard the two Tigers pass him, not by their footsteps, but by the dripping of the water as it ran off their bodies on to the sand. Next night they came again. This time, though it was dark, he shot one in a very ingenious manner. The two Tigers walked into the water, and apparently lay down or sat down in it, with their heads out. They moved only occasionally, lapping the water, but did not greatly disturb the surface. On this was reflected a bright star from the sky above. The sportsman put the sight of the rifle on the star, and kept it up to his shoulder. Something obliterated the star, and he instantly fired. The "something" was the Tiger's head, which the bullet duly hit.

In most parts of India Tigers are now scarce and shy, except in the preserves of the great rajas, and the dominions of some mighty and pious Hindu potentates, such as the Maharaja of Jeypur, who, being supposed to be descended from a Hindu god, allows no wild animals to be killed. There the deer and pigs are so numerous that Tigers are welcome to keep them down.

FISH

"How vain are the pleasures we oft seek to win
To the first little minnow we caught with a pin."

FAMILIAR FISH

By JOHN T. NICHOLS

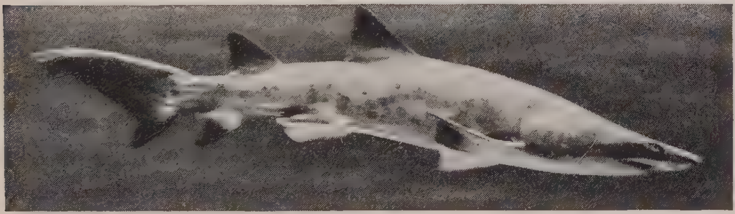
SPACE permits of the mention of only a few representative kinds of the vast number of fishes which exist today. These are arranged so far as possible in the order of their appearance in the long process of evolution.

The Sand Shark

Technical name: *Carcharias littoralis* (derivation, "carcharias," an old name of large Sharks: "littoralis," of the shore). An abundant Shark of no great size found on sandy Atlantic shores south to the Carolinas, where it reaches a length of six or seven feet.

Sharks are a very ancient type of fish, which preceded the more modern bony, often spiny-finned fishes which now predominate in the seas of the world. Whereas most fishes lay a multitude of minute eggs only a small percentage of which ever reach maturity, Sharks either lay large eggs protected by a horny egg-case, or, as with the majority of modern species, the eggs develop within the body cavity of the mother, and the young are born good-sized and fully developed.

Courtesy of New York Zoological Society



SAND SHARK
From a photograph by E. R. Sanborn

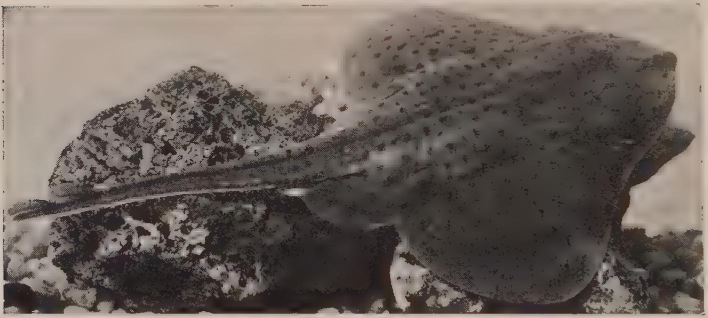
A Shark's mouth is situated on the lower side of his head, but it is unnecessary for him to turn on his back to use it, though he usually finds it most convenient to do so in seizing an object from the surface of the water.

THE COMMON SKATE

Technical name: *Raja erinacea* (derivation, "raja," ray; "erinacea," like the hedgehog, prickly). Skates are Sharks with the head, body, and breast fins fused and flattened into a more or less diamond-shaped disk, one angle formed by the snout, the hard narrow tail, on which the back-fins are situated, extending from the opposite angle.

SKATES are flattened to lie on the bottom as Flounders are, but whereas the Flounder lies on one side and its structure has become twisted to correspond, the Skate lies face downward and has retained its bilateral symmetry. Skates' teeth are small, blunt, and arranged in a pavement-like manner, whence we can deduce that much of their food is made up of small shelly bottom creatures. The egg-cases of Skates are flat, leathery, oblong, with forward and backward directed prongs at the corners.

Courtesy of New York Zoological Society



COMMON SKATE
FROM A PHOTOGRAPH BY E. R. SANBORN

Many of them are cast up along the seashore, objects of interest to children. In some countries Skates (especially the larger kinds) are highly esteemed for the table, the meaty bases of the wing-like sides of the disk being the part so used.

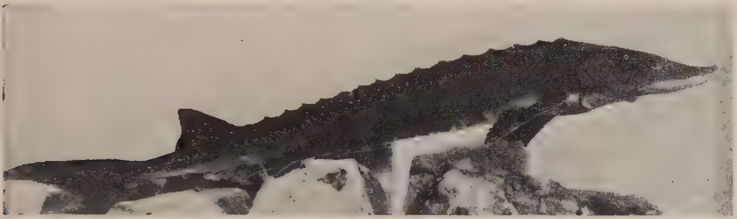
Sharks and Rays are the oldest living fishes. They were unquestionably the ancestors of all more modern kinds. The Sturgeon, the Gar and the Mudfish belong to the heterogeneous group of fishes called Ganoids, an intermediate level of fish development.

THE LAKE STURGEON

Technical name: *Acipenser fulvescens* (derivation, "acipenser," an old name of the Sturgeon; "fulvescens," somewhat tawny in color). An important food-fish of the lakes and rivers of Canada and the northern United States. Sturgeons are large fishes with the mouth placed on the under side of the head and preceded by fleshy barbels. They have an elongate pointed snout. The upper lobe of their tail-fin is much the longest, and the vertebral column is deflected upward into it. In place of scales the skin bears rows of bony tubercles of different sizes. The Lake Sturgeon differs little from the common Sturgeon which enters Atlantic rivers from the sea, but does not reach so large a size, about 100 pounds being the maximum. Color: more or less reddish-brown.

STURGEONS are bottom feeders, eating small fish, crustacea and so forth. Their flesh is valued for food, and the famous Russian caviar is made of Sturgeon eggs. The unsymmetrical tail-fin is an inheritance from early fishes, the spinal cord having been bent upward in the evolution of the fish's tail, and the symmetrical tail and tail-fin of most modern species acquired from an unsymmetrical one. There is a record of a Pacific Sturgeon from the Columbia River over ten feet long, weighing a thousand pounds.

Courtesy of New York Zoological Society



LAKE STURGEON
FROM A PHOTOGRAPH BY E. R. SANBORN

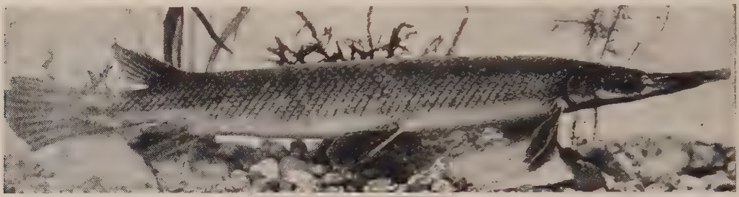
THE SHORT-NOSED GAR

Technical name: *Lepisosteus platostomus* (derivation, "lepisosteus," from scale and bone; "platostomus," flat-mouth). An elongate, cigar-shaped, fresh-water fish of the Mississippi Valley and southeastern United States, reaching a length of two or three feet. Jaws long, broad, and armed with formidable teeth so that from eye to snout is considerably more than from eye to back of head. Body covered with large diamond-shaped, tough, smooth, enameled, non-overlapping scales. Tail fin not quite symmetrically rounded. Color: brownish or greenish above, paler below, with large black spots behind. The related Longnosed Gar is more slender, with a very long, narrow, cylindrical snout. The Alligator Gar, with roughened scales, reaches an enormous size, one twelve feet in length having been reported from Louisiana.

GARS are an ancient type of fish, gar-like species having been much more numerous in a previous stage of the earth's history than at the present day. Their large size and tough exterior renders them immune from attack by any other denizens of the waters they frequent, with the possible exception of the Alligator. On the other hand they are very destructive to other fishes. They are not valued as food.

The Short-nosed Gar is abundant in sluggish, weed-choked waters of the south. It lies motionless, balanced in the water, ready to dart upon the prey which may swim in front of it. When alarmed it drives straight forward through water or weeds indifferently.

Courtesy of New York Zoological Society



SHORT-NOSED GAR
FROM A PHOTOGRAPH BY E. R. SANBORN

THE MUDFISH

Technical name: *Amiatus calvus* (derivation, "amiatus," from Amia, the ancient Greek name of some dissimilar fish). A fresh-water fish of the Great Lakes, Mississippi Valley, and southeastern States, reaching a length of a foot or two. Blunt-headed, elongate, cylindrical, with spineless rounded fins. The back-fin is very long, with many rays. Color: dark, more or less green. The male has a round black spot surrounded by an orange or yellow ring at the upper base of the tail-fin.

MUDFISH are a voracious and gamy fish, but worthless for food, being peculiarly soft and unpleasant to eat. Before the more modern types of fishes which now populate the seas and rivers of the world had arisen in the course of evolution, there were species related to the Mudfish, the Sturgeon, and the Gar. These doubtless then abounded in salt-water as well as fresh, whence, unlike the still older Sharks, competition with more highly organized forms has since driven them.

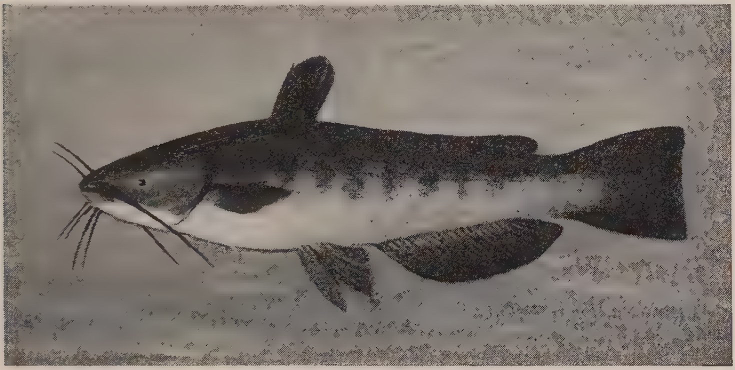
Mudfish are extremely tenacious of life, capable of surviving a long time out of water, or under conditions of impure water, or starvation, which would prove fatal to most fish. Other names for the species in common use are Dogfish and Bowfin.

THE COMMON BULLHEAD OR HORNED POUT

Technical name: *Ameiurus nebulosus* (derivation. "ameiurus," from the Greek, curtailed, the tail-fin not forked; "nebulosus," clouded). A fresh-water fish abundant in all quiet waters of the northeastern United States, extending south to Florida, and introduced elsewhere, as into rivers of the Pacific Coast. Color: dusky, paler below, with vague clouded markings. There are several other Catfishes, of which the Horned

Pout is the commonest species. Most of them have forked tail-fins, whereas its tail-fin is squarish.

The food value of this fish depends on the water from which it is taken. If this be warm and muddy it has a muddy flavor and would be considered worthless by most persons; if cool and clear, the fish is excellent. An omnivorous feeder, it bites readily on a variety of bait, but there is none better than the angleworm, the standard of boyhood days. As the Horned Pout moves about in a leisurely manner over the bottom of the pond, the barbels surrounding its mouth, which give it a cat-like appearance, are kept in constant motion. They doubtless have a sensory function and help it to locate its food. Perhaps this has some bearing on the fact that it is active and takes the hook readily at night as well as in the daytime. Like all the Catfish family it is a vigorous fish, very tenacious of life, and will live a long time out of water. Little fellows make interesting aquarium pets.



COMMON BULLHEAD

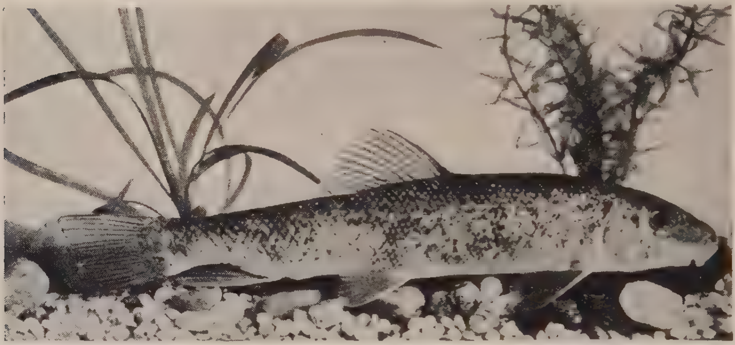
The related Channel Catfish is a species of the middle west reaching a larger size, more slender, with small dark spots, and highly prized as food. Here also the giant Mississippi Catfish reaches a length of five feet and a great girth.

The Common Sucker

Technical name: *Catostomus commersonii* (derivation, "catostomus," from the Greek, below-mouth; "commersonii," in honor of Commerson, a French naturalist). An abundant fresh-water fish widely distributed over the United States; reaching a length of about a foot. Mouth more or less circular, situated under the projecting snout, with very thick lips which can be protruded.

In spring Suckers run up into small brooks to deposit their spawn. The males now have more or less rosy colors. They may be found at this season lying close to the edge of the brooks out of the current, and are sometimes snared by boys with a noose on the end of a stick. Suckers are promiscuous bottom feeders, but their food is small and it is difficult to induce them to take the hook. Large-scaled, white-sided species found in various parts of the interior of the United States, known as Red Horse and Mullet, reach a considerable size and are food fish of importance. In Atlantic coastwise streams the Chub Sucker is very abundant. This species has no lateral line, and its young have a bold, black longitudinal stripe.

Courtesy of New York Zoological Society



COMMON SUCKER
From a photograph by E. R. Sanborn

The Carp

Technical name: *Cyprinus carpio* (derivation, "cyprinus," ancient name of the carp; "carpio," carp). A rather large, small-mouthed, large-scaled, mud-loving, fresh-water fish originally of Asiatic origin, introduced into Europe in ancient times, thence more recently into America.

Mirror Carp are merely a domesticated variety of the ordinary Carp which was probably introduced into Europe from Asia a long time ago. In this variety the scales are three or four times the ordinary size, and do not cover the body, but form one to three rows along the sides, with naked skin between.

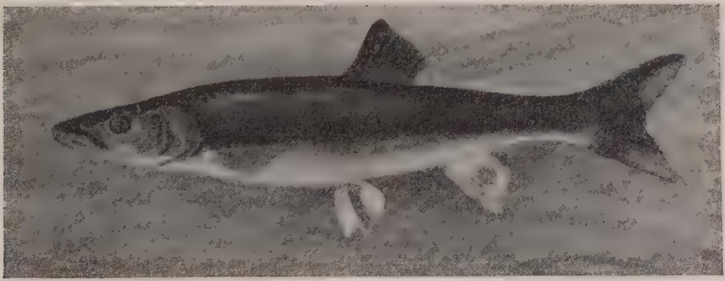
The mouth of the Carp is toothless, but it has strong molar teeth on the bones of the throat. It is one of the largest species in the family to which fresh-water Minnows belong, having reached the record weight of

90 pounds. Carp are vegetable feeders to a considerable extent. They root about in the mud, destroying aquatic vegetation and sometimes rendering waters unsuitable for more desirable fishes which might otherwise occur in them. They are very prolific, and have become widely distributed in American fresh waters. As food Carp is cheap, wholesome, and at times not bad flavored, but its meat is soft, and usually has a muddy taste.

THE MIRROR CARP

The Sacramento Pike, Squaw-Fish, or Yellow Belly

Technical name: *Ptychocheilus oregonensis* (derivation, "ptychocheilus," from the Greek, fold and lip, the skin of the mouth behind the jaws being folded; "oregonensis," inhabiting Oregon). A large, slender, active, voracious river fish of the Pacific slope from Vancouver Island south to California. Its long, large-mouthed head has a pike-like appearance, but it is a member of the Carp and Minnow, not the Pike, Family, and its



SACRAMENTO PIKE

jaws are toothless. Color: dull greenish, more or less silvery below, the fins with red or orange in spring.

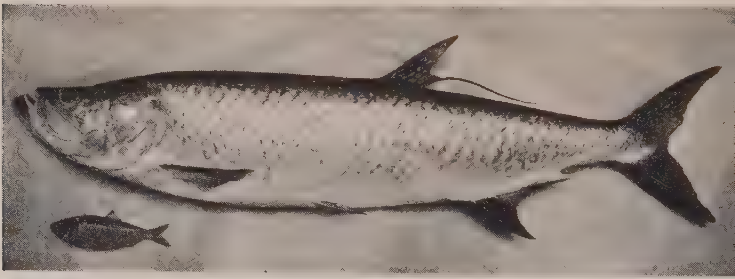
The Minnow Family is the largest family of fresh-water fishes in the northern continents, where it is represented by innumerable species. Its members as a rule are of small size, but not invariably so. In Asia there is the Carp, in our western States the Squaw-fish, and a very similar still larger fish known as White Salmon, which inhabits the valley of the Colorado River, reaches a weight of 80 pounds, and is of commercial importance. The Squaw-fish grows to be from two to four feet long, affords interesting fishing, and is used as food, but is not much prized as a food-fish.

The Tarpon

Technical name: *Tarpon atlanticus* (derivation, "tarpon," from the vernacular "atlanticus," Atlantic). An enormous, large-scaled herring-like fish, entering bays and estuaries of the warmer parts of eastern North America. A magnificent game fish

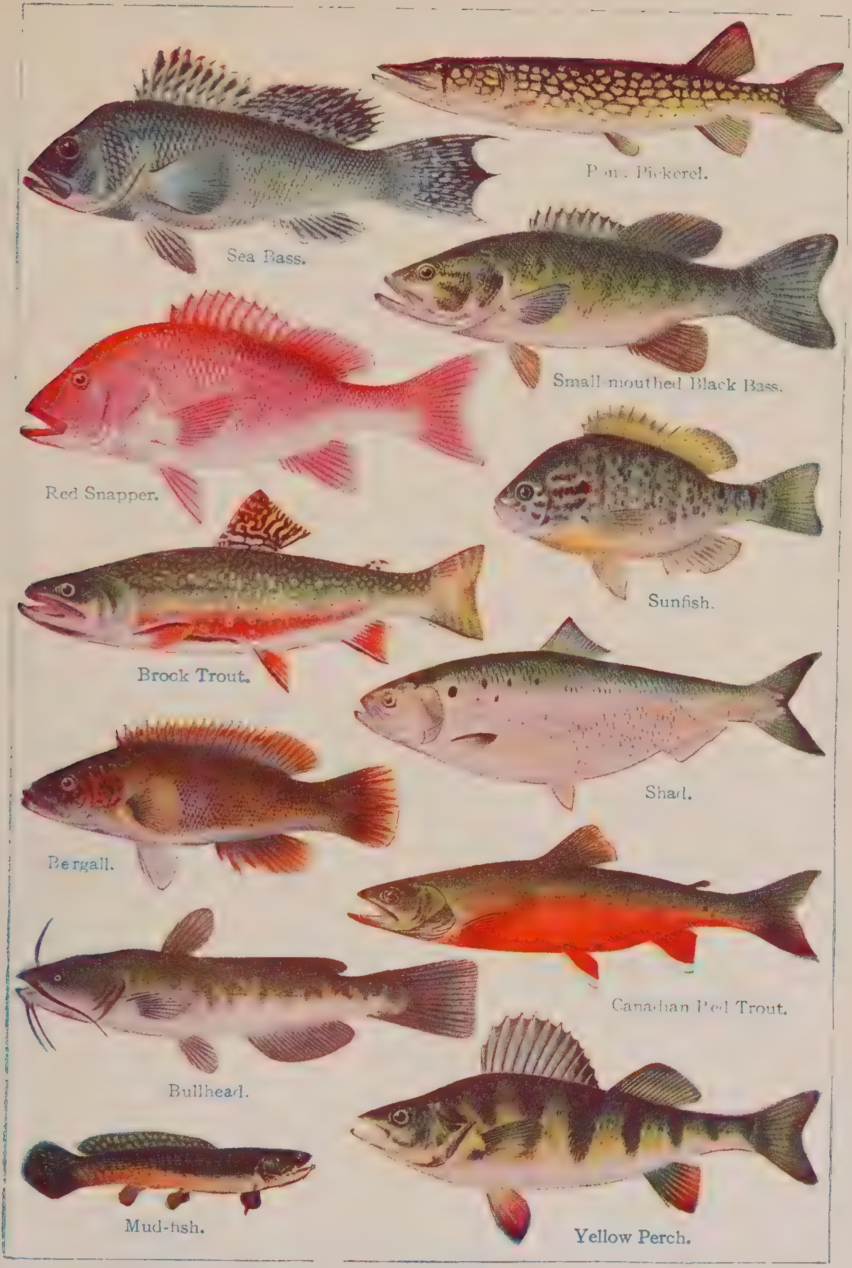
Though large Tarpon enter the shallow heads of bays and the estuaries of rivers, it is apparently for food, and not to deposit their spawn. Their spawning habits are unknown, but it is supposed that the eggs are deposited in the ocean. Quite likely the young pass through a larval stage, as some related fish do. Very small Tarpon have seldom been captured. Partly grown fish are comparatively common up coastal streams in fresh-water, but probably have not originated there.

Courtesy of American Museum of Natural History



TARPON
The little fish is a Menhaden

The Tarpon where it is fished for near shore, moves about in a leisurely manner locating the small fish on which it feeds and which its size and quickness enable it to capture without difficulty. It is not averse to crossing flats where the water is so shallow that its back fin must of necessity project above the surface. Occasionally it rolls its back out


Pond Pickerel.
Sea Bass.
Small-mouthed Black Bass.
Red Snapper.
Sunfish.
Brook Trout.
Shad.
Bergall.
Canadian Red Trout.
Bullhead.
Mud-fish.
Yellow Perch.

NORTH AMERICAN FOOD AND GAME FISHES

of water in a sportive, porpoise-like manner. Tarpon are taken trolling with mullet bait. When hooked they employ all their strength, agility, and weight, running, leaping, and maneuvering, and if the fisherman loses his head for an instant, will either shake out the hook or break his tackle, making their escape in any case. The record rod-and-reel Tarpon was 7 feet 8 inches long, and weighed 232 pounds. One of over 8 feet has been netted in Florida.

THE SHAD *

Technical name: *Alosa sapidissima* (derivation, "alo," to nourish; "sapio," to have a flavor). A salt-water fish, native to waters of the Atlantic, along the entire eastern coast of the United States north to the Gulf of St. Lawrence; introduced into the Sacramento River, California, whence it has spread northward to southeast Alaska. Enters the rivers, ascending to fresh water for propagation. Body deep and compressed, the depth varying with the sex and spawning condition, but averaging about one-third the body length. Mature males average about three pounds, females 4¾ pounds. In the early history of the fisheries, Shad weighing 11, 12, and even 14 pounds were reported, but 9-pound Shad are very rare on the Atlantic coast, and 10 pounds seems to be the maximum. On the Pacific coast Shad average a pound or more heavier than on the Atlantic, occasionally attaining a weight of 14 pounds. Many have been reported as weighing 9 to 12 pounds.

THE Shad is one of the most palatable and popular of fishes. Its flesh is rich but not oily, and the roe is considered a delicacy. It is the most valuable fish of the Atlantic coast and, next to the Pacific Salmon, the most important species inhabiting the waters of North America.

SHAD

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* From "Artificial Propagation of Shad and Pike Perch," issued by the United States Commission of Fish and Fisheries.

The Shad passes the most of its existence at sea, and little is known of its habits and movements when out of the rivers. The ocean areas to which it resorts are unknown, and of what its salt-water food consists has not been determined.

THE ROCKY MOUNTAIN WHITEFISH

Technical name: *Coregonus williamsoni* (derivation, "coregonus," an old name for the European Whitefish; "williamsoni," for Lieut. Williamson, in charge of a division of the Pacific Railroad explorations). A slender, active, small-mouthed fish of no great size, found in streams from the Rocky Mountains to the Pacific in the northern United States and Canada. Like their larger-mouthed, smaller-scaled relatives the Trout, Whitefish have a small adipose fin, so-called, on the posterior part of the back, well behind the regular back-fin. Color: bluish above, sides silvery, more or less white below.

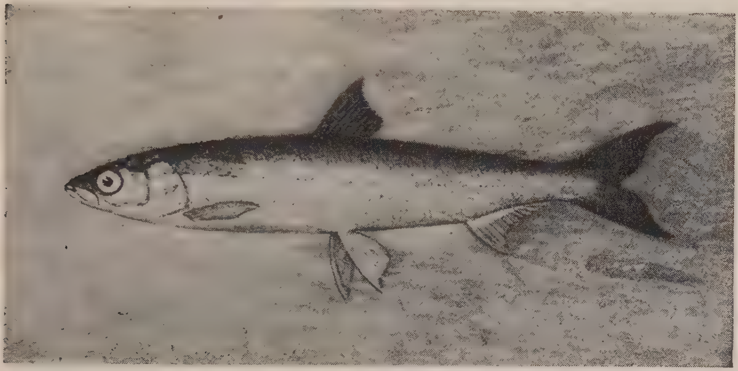
WHITEFISHES are related to the Trout and Salmon, but lack the large mouth, strong teeth, and predacious habits of these. Among those found in lakes are large, deep-bodied species, perhaps the most important American fresh-water food-fish. Their meat is white, flaky, and of very delicate flavor, particularly delicious broiled. The Rocky Mountain Whitefish, which inhabits streams rather than lakes, is not large enough to be of commercial importance, for, though it grows to be a foot long, it is slender and of no great weight. As a game fish, however, it stands first among its kind. It readily takes the fly, and is quite generally and erroneously called Grayling, inhabiting an extensive region where the true Graylings do not occur.

ROCKY MOUNTAIN WHITEFISH

THE CISCO OF LAKE GENEVA

Technical name: *Leucichthys sisco* (derivation, "leucichthys," from the Greek, white-fish; "sisco," from the vernacular). A fresh-water fish related to the Whitefishes, but more herring-like, with larger mouth. Reaches a maximum length of less than a foot. Found in numerous small lakes in Indiana and Wisconsin. Color: dark bluish or greenish above, sides silvery white.

Numerous species of closely related Ciscos or Lake Herrings occur in the Great Lakes and neighboring waters. They swim in schools, are exceedingly abundant, and are valued as food. The present species lives in deep waters except in December, when it ascends brooks to spawn.



CISCO OF LAKE GENEVA

It is smaller than some of the others, but a superior table fish. Lake Herrings are active, voracious fish. They have long slender gill-rakers, an approach to the true Herring, which they probably resemble somewhat in feeding habits. Perhaps their chief importance is as food for larger fishes of greater commercial value.

The Silver Salmon

Technical name: *Oncorhynchus kisutch* (derivation, "oncorhynchus," hook-snout; "kisutch," the vernacular name in Alaska). A food fish which enters the rivers of the Pacific coast abundantly, south to northern California, spawns once and then dies. Grows to about 10 pounds. Color: back greenish, sides silvery, spotted with black on the upper fins; not unlike the larger Chinook Salmon but less spotted.

This species, known as Coho Salmon to the north, is intermediate between the early and late running Pacific Salmons. It enters fresh water from the sea during the summer months, spawning abundantly in the lower tributaries of such master streams as the Columbia. It is taken in numbers at low water below the rapids, while waiting for fall rains in order to complete its journey to the spawning grounds. Such fish largely supply the cold-storage winter salmon of eastern markets, which is, therefore, inferior in quality. The Coho affords good rod-and-line fishing in the salt waters of Puget Sound, as the Chinook does in Monterey Bay, where it is taken by trolling. When Pacific Salmon enter fresh water and head up stream to spawn they cease to feed, their digestive tracts degenerate, and only occasionally will one strike at a lure in memory of bygone days, never to return.

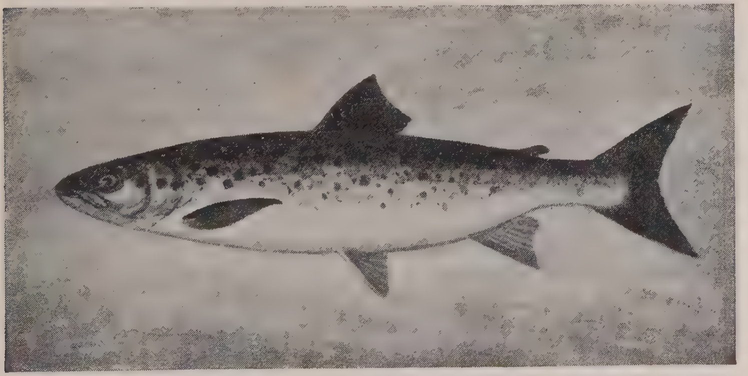
There are five species of Pacific Salmon with similar habits. In order of importance these are the Chinook or King Salmon, Blue-back Salmon, Sockeye or Redfish, Silver or Coho Salmon, Hump-back Salmon, and Dog Salmon. When about to spawn they become poor of flesh, the males developing long hooked jaws and a distorted shape. All spawn in the fall, but the Chinook, which ascend to the head-waters of the larger rivers, usually hundreds of miles from the sea, and the Blue-back Salmon, which spawn above clear mountain lakes, run in from salt water in the spring and early summer when still in prime condition. The Hump-back Salmon which seek smaller streams usually do not put in an appearance until toward fall and have comparatively little food value for that reason. A large catch is, however, taken in marketable condition in the waters of Puget Sound, where the trade name is "Pink" Salmon, the flesh being less richly colored than in some of the other species.

SILVER SALMON

Like other Pacific Salmon the Blue-back runs up from the sea, spawns once, and then dies. It spawns in the mouths of streams above clear cold mountain lakes, where the young spend their first year before descending to salt water. The old fish coming in on their last pilgrimage recognize water from such lakes unerringly, and will only enter rivers which have such tributary lakes. To appreciate the keenness of perception necessary for the proper functioning of this instinct, think of the mighty Columbia River. Some of its head-waters have stood in lakes, others have not, all are mixed together and flow for hundreds of miles, now sweeping through broad navigable reaches, now roaring in rock-bound cataracts, to be mixed with the sea water by the changing tides in a broad estuary. When these fresh waters finally flow out over the sand bars at the river's mouth into the broad Pacific, the Blue-back Salmon detect and follow up the lake taint, crowding into the river. This is the salmon with the reddest meat, called Redfish in Alaska, where it constitutes the bulk of the salmon canned. There is a small variety of the Blue-back known as Kennerly's Salmon, maturing at about ½ pound weight.

The Winninish and Land-Locked Salmon

These are land-locked forms of the Atlantic Salmon of Europe and North America, formerly running into rivers from the sea south to the Hudson and rarely to the Delaware, *Salmo salar* ("salar" from salio, to leap). The Land-locked Salmon is a lake fish, rarely entering streams, originally found from Lake Sebago, Maine, northward, but now widely introduced, whereas the true Winninish came from the Saguenay River, Canada, and surrounding waters. Land-locked Salmon differ little from those which get their growth in the sea, but are smaller, less silvery, the black spots as a rule bolder, and are more vigorous and active, exceptionally fine game fish, even for salmon. The color of the Atlantic Salmon is brownish or steel-gray above, silvery on the sides, with black spots, usually more or less X-shaped, and frequently with red spots or blotches. The teeth on the vomer or central bone of the roof of the mouth are weak in these salmon and lost with age, a technical character which separates them from the various species of trout of the genus *Salmo,* which also have black spots.



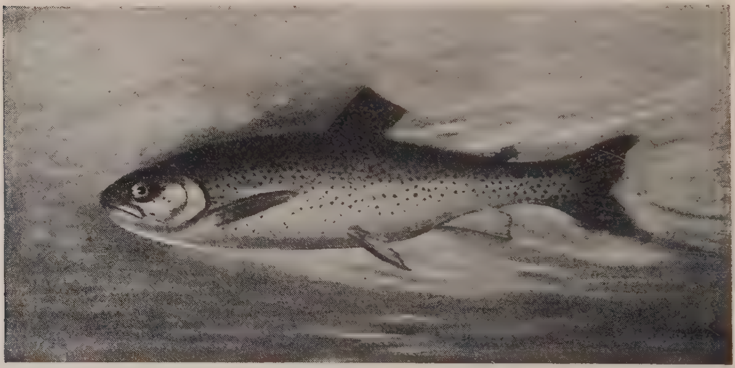
LAND-LOCKED SALMON

PROBABLY the largest known Atlantic Salmon, which weighed 83 pounds, was taken in Great Britain in 1821. There is a record of one four feet long weighing 41½ pounds caught on rod and reel in Newfoundland.

THE RAINBOW TROUT

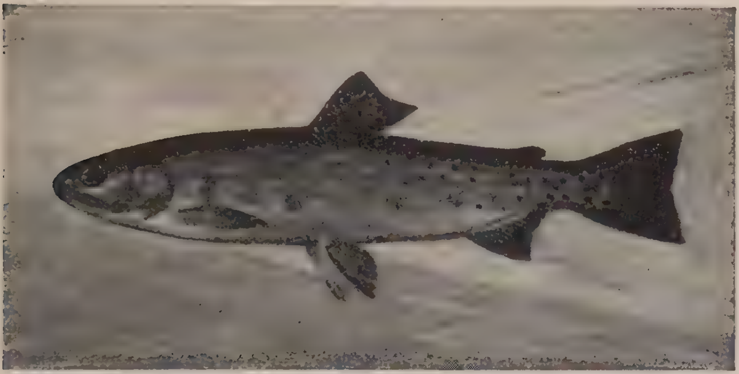
Technical name: *Salmo irideus* (derivation, "salmo," salmon; "irideus," rainbow-like). A game fish originally from the rivers of the Pacific Coast Range, entering the sea, now found almost everywhere where trout have been artificially introduced. Weighing when grown from one-half a pound upward. Color: bluish, the sides silvery, finely and irregularly spotted almost everywhere with black, a rose-red lateral band.

RAINBOW TROUT, which grow to six pounds or so, and the Steelhead, which reaches 30 pounds, are very much alike, in fact it has not been satisfactorily demonstrated that a Rainbow Trout may not at times go on a prolonged sea cruise and come back a Steelhead Salmon. It is, then, questionable whether the very large Rainbow Trout, from time to time recorded with every indication of authenticity, should not more properly be called Steelheads.

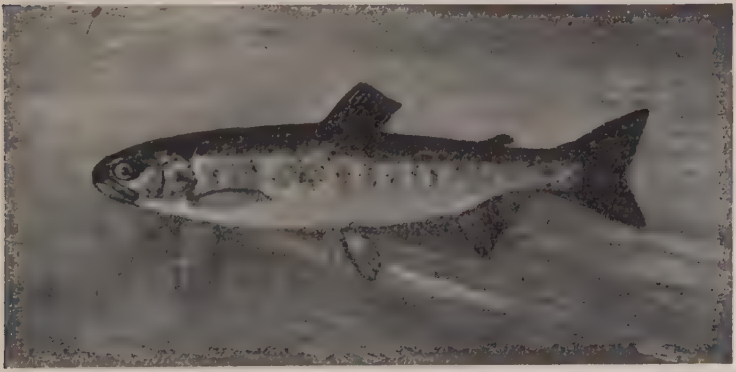

RAINBOW TROUT

Though popular with anglers, this species is generally conceded to be less game and clever than the Eastern Brook Trout, or in fact the more nearly related Cut-throat Trouts whose home is the Rocky Mountain system, as that of the Rainbow is the Coast Range. The two are found together north of the Great Basin, but it is the Cut-throat which extends on into Alaska. This Trout feeds on worms, larvæ and the like which it finds under water, and to a greater or less extent on fortuitous insects drifting on the surface. No fault is to be found with it as table fish.

As anglers of experience know, Trout are very sensitive to differences in the waters where they occur. Those from one stream are not exactly the same as any found elsewhere, but differ, if ever so slightly in shade of color or form, so that if the eye be sufficiently trained they can be recognized. The clear alpine streams of California's mountains have produced a fish of surpassingly high color from the Rainbow stock. Golden Trout from above the falls in these waters are more superlatively golden than those below, and those from a certain "Volcano Creek" have been named the Roosevelt Trout in honor of Theodore Roosevelt.



GOLDEN TROUT

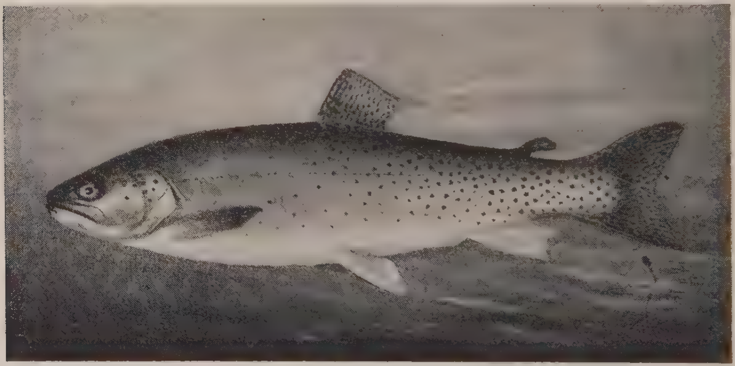


ROOSEVELT TROUT

THE ROCKY MOUNTAIN, CUT-THROAT, AND BLACK-SPOTTED TROUT

Technical name: *Salmo clarkii* (derivation, "salmo," salmon; "clarkii," for Captain Clark of the Lewis and Clark Expedition). The brook trout of the Rocky Mountain region from the United States to Alaska. Unlike the Eastern Brook Trout, which is rightly speaking a Charr, this is a true Trout, closely related to the European fishes which are so-called. Very variable in different localities, more or less marked with small conspicuous black spots, typically with a red streak under the lower jaw on either side of the head. Mouth large.

TROUT of the Rocky Mountain system are somewhat different from the Rainbow Trout, its varieties and related species, which are native to the Pacific coast-ranges. For one thing, many of them inhabit smaller streams, and are cleverer, gamier fish. Their scales are finer than those of the typical coastwise Rainbow Trout, their mouths larger, and they usually do not have the pink lengthwise stripe which gives the Rainbow its name. It would be useless to review the many varieties of Rocky Mountain Trout which have been described. Their black spots vary somewhat as follows: fish from California to the Yellowstone River and northwestward have black spots almost as numerous in front as behind, those in the Great Basin have them smaller, and those from Lake Tahoe have large but sparsely scattered spots; fish from Colorado and the head-waters of the Arkansas and South Platte rivers have the spots more or less confined to the posterior parts, and one or two isolated varieties further northwest have this same type of spotting.

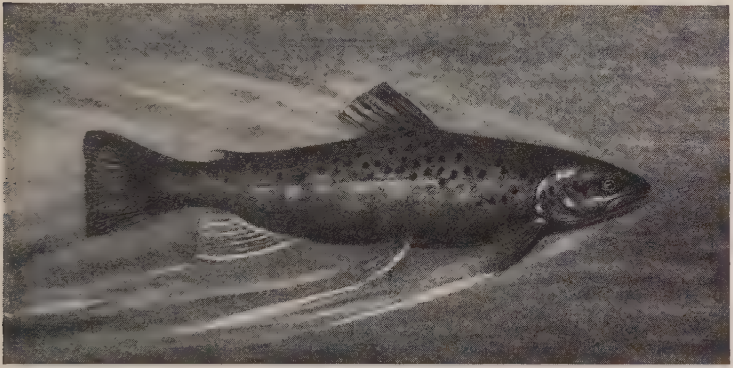


BLACK-SPOTTED TROUT

THE BROWN, OR GERMAN, TROUT

Technical name: *Salmo eriox* (derivation, "salmo," salmon; "eriox," from the Greek, superkeen). A European trout related to the Rainbow, Steelhead, and Cut-Throat Trouts of the west, widely planted in American waters. An excellent table fish, often weighing 10 to 20 pounds. Ground color of the body brownish or brownish-black, unlike the gray of the Salmon or of the Rainbow Trout; irregularly spotted with black, the spots either circular or X-shaped, some of them with pale borders; red spots or blotches also usually present.

Eggs of the Brown Trout were first shipped to this country from Germany, successfully hatched, and planted in the spring of 1883 in Michigan. Two years later a shipment of eggs was received from which about twenty-eight thousand fry were planted, mostly on Long Island and near the Hudson River. Since then the species has been widely introduced.



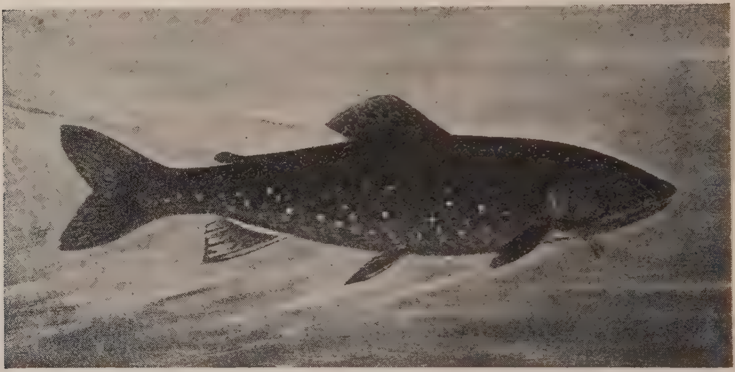
BROWN TROUT

This Trout ranks high as a game fish, but is generally conceded to be outclassed as such by the Brook Trout. On the other hand, it adapts itself to certain waters better than that species. It has been claimed that the Brown Trout is more of an angler's fish than the Rainbow. Its large size and rapid growth recommend it as a food-fish. The Brown Trout has also been introduced into New Zealand, where a 28½ pound example is recorded.

The Lake Trout

Technical name: *Cristivomer namaycush* (derivation, "cristivomer," crested vomer, referring to the shape of the vomer or central bone of the roof of the mouth; "namaycush," an Indian name). A large sluggish Trout reaching a maximum weight of between 50 and 100 pounds, found in northern lakes across the continent and north to the Arctic Circle. Color: olive, with irregular paler spots, and paler below, but very variable. Tail-fin forked.

This is the ogre of the lakes, and is usually to be found in their gloomy depths except during the spawning season. Big-mouthed, strong-toothed, and voracious, it is not uncommon for it to swallow a fish nearly as large as itself. In the larger lakes of the north it finds an abundant food supply in the small schooling whitefishes known as Lake Herring. Yet, with such noble relatives as Brook Trout and Salmon it shows remarkably little spirit when hooked, and the sportsman's most thrilling memories of a successful encounter with a Lake Trout may well be blended with the gratification of his appetite. It is too rich and oily to be very good if eaten fresh, but is very excellent after having been salted and soaked in cold water.



LAKE TROUT

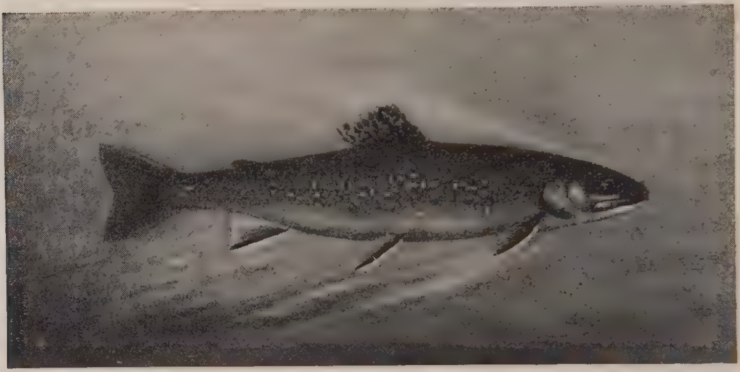
The Eastern Brook Trout

Technical name: *Salvelinus fontinalis* (derivation, "salvelinus," from an old vernacular name of the Charr; "fontinalis," inhabiting springs). Across northern North America from Labrador to Saskatchewan, southward in the Allegheny system of the Eastern States, reaches the sea from New Jersey north, and enters it rather freely to the northward. Not found west of the Mississippi except as artificially introduced. Color: with red or pale spots and blue markings, never with black spots. Back and especially back-fin barred or vermiculated, a diagnostic color. Large fish have long jaws and a broad square tail. Seldom exceeds two or three pounds in weight, and a five-pound fish is a very large one. The heaviest known, 14½ pounds, Ontario, 1916.

For Brook Trout, water must be pure and cold, preferably swift, though spring-flooded stump-land, full of snags, is congenial. They lie in pools or eddies or behind snags, whence they dart away with lightning rapidity when alarmed, or spring upon their prey (in summer largely insects which drop by chance upon the surface of the water) when it drifts within range. Like its relatives, the Brook Trout spawns with the coming of

A SUMMER DAY

cold weather, and should be fished in the spring. One of the wariest, quickest, gamest and most delicious of fishes. When hooked it is quick to take advantage of brush and snag and current in a manner that tests the fisherman's speed and presence of mind. Many an eastern fished-out stream on the borders of town still holds here and there a wily old trout, living out his life serenely, and fairly safely, in his favorite secluded pool.



EASTERN BROOK TROUT

The Canadian Red Trout

Technical name: *Salvelinus marstoni* (derivation, "salvelinus," an old name of the Charr; "marstoni," for R. B. Marston, one time editor of the *Fishing Gazette*, London). A representative of the Arctic Charrs, which are all closely related and difficult to differentiate. Found in certain waters of eastern Canada famous for their salmon and trout fishing.

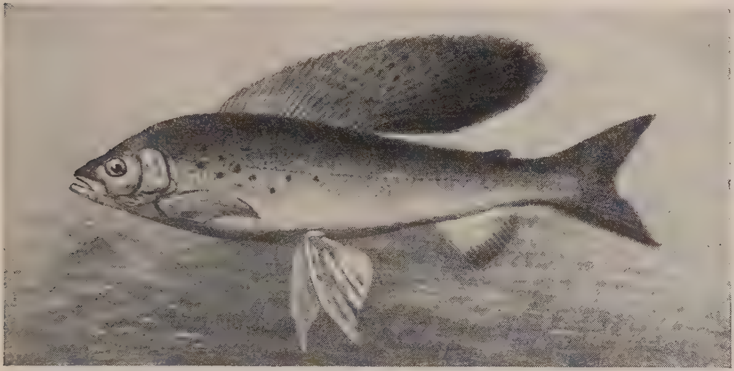
Canadian Red Trout in high color are gorgeously beautiful fish. They are southern left-overs which have perhaps been left here and there by the retreating cold of the glacial period, and are related to the Arctic Charrs which abound in all the lakes of the far north. Their capture by anglers is sufficiently unusual to arouse considerable interest. Whether they should be classified in one or several species of races is uncertain, and for the present the name *marstoni* will serve for them, as well as any other.

The Alaska Grayling

Technical name: *Thymallus signifer* (derivation, "thymallus," an old name of the Grayling which is supposed to have the odor of thyme; "signifer," standard bearer). A slender, active, fresh-water fish of the far north, from the Mackenzie to Alaska and the

Arctic Ocean, reaching a length of eighteen inches. Related to the Trouts. Color: dark gray, purplish on the sides, with deep blue spots, and a little red on the fins.

ALASKA, or more properly Arctic Grayling, are abundant in clear mountain streams, showing a particular fondness for swift water. This fish takes the fly readily, whence we may infer that insects which drop upon the water's surface during the short summer time in the far north form an important part of its food at that season. During the long winter the swift waters which it loves may yet be unfrozen, but insects are of course out of the question. The European species is said to devour small shellfish and the eggs of other fishes, and these may well be the winter staples of Grayling in Alaska.



ALASKA GRAYLING

Like its relatives of other regions, this beautiful species is a food and game fish of quality.

THE COMMON EEL

Technical name: *Anguilla rostrata* (derivation, "anguilla," an ancient name for the Eel; "rostrata," snouted). The elongate, snake-like form of the Eel is too well known to need comment. The Common Eel has a well-developed breast-fin back of the head; its back-fin commences considerably farther back and extends uninterruptedly around the end of the tail to join the anal fin below; its skin is covered with minute elongate scales arranged in groups at right angles. Color: dark olive, more or less yellowish on the sides, paler, sometimes silvery or whitish below. Abundant in Atlantic coastal waters, bays, and rivers of the United States, penetrating to almost every little fresh-water pond of the interior.

THE EEL is an omnipresent dweller of varied waters with a predilection for mud and weed. He has a large mouth and a good appetite, preying on small fishes, crabs, and animals of every description, and is not above assuming the roll of scavenger. Eels travel through mud almost as readily as through water, and are said sometimes to come out and move across country on wet nights. They spawn only in the deep sea, and pass through a larval stage on the high seas. Larval eels are flattened, that is tape-shaped and transparent. In assuming the cylindrical form of the adult and entering coastal bays they actually shrink in size.

THE POND PICKEREL

Technical name: *Esox reticulatus* (derivation, "esox," ancient name for the Pike; "reticulatus," reticulated). Found throughout the eastern United States. Abundant in ponds. Reaches a length of two feet. Color: green above, pale below the sides with a net pattern of dark streaks.

THERE are five American Pikes or Pickerels. They are all elongate, cylindrical fish, with large mouths armed with strong teeth, and a single fin without spines placed far back on the back. They are seldom seen swimming actively about but lie motionless, balanced in the water, ready to dart upon any living object that is so unfortunate as to come within range. The larger species are much sought by rod-and-line anglers as game fish and they are all excellent as food.

The Muskallunge, which is grayish and usually spotted with dark, is the largest, individuals over 50 pounds in weight having been taken in Wisconsin lakes. Averaging somewhat smaller is the Northern Pike, which is greenish and spotted with pale. Still smaller, though a good-sized fish a foot or two long, is the Pond Pickerel, which is greenish with dark streaks on the sides forming more or less of a net pattern. There is much color variation, however, and it should be noted by anglers that

UNSPOTTED MUSKALLUNGE

the Muskallunge has the lower side of the head without scales, whereas in the Pike the scaleless area is restricted to the posterior part, on the opercle or gill-cover, and in the Pond Pickerel, like the still smaller Banded Pickerel (which has the sides with curved bars, the lower fins usually reddish or yellowish) and Vermiculated Pickerel (its western representative) the entire side of the head is scaly.

Unspotted Muskallunge are merely a color variety of the ordinary Muskallunge, though at one time thought to be a distinct fish and given the name *immaculatus*.

We now come to thoroughly modern spiny-rayed fishes, all more or less perch-like, of which a very large number of species are found both in fresh and salt water.

The Common Sunfish

Technical name: *Eupomotis gibbosus* (derivation, "eupomotis," genuine-sunfish, pomotis, the sunfish, from opercle and ear; "gibbosus," gibbous). A small, deep-bodied, spiny-finned, bright-colored fish, abundant in quiet waters of the northeastern United States: thence to Florida and the northern Mississippi Valley. Color: olive and silver, marked with blue and orange. The gill-cover prolonged behind in a convex, membranous flap about as deep as long, black, with its lower posterior part bright scarlet. Mouth rather small, tail-fin concave or slightly forked.

When the youthful fisherman is no longer satisfied to angle for Minnows with a bent pin, the chances are his next prize will be the Sunfish, or as it is sometimes called on account of its flatness, Punkinseed. Were this a larger species it would rank high as a game fish, for it shares some of the vigor and cleverness of its noble relative, the Black Bass. It guards

COMMON SUNFISH

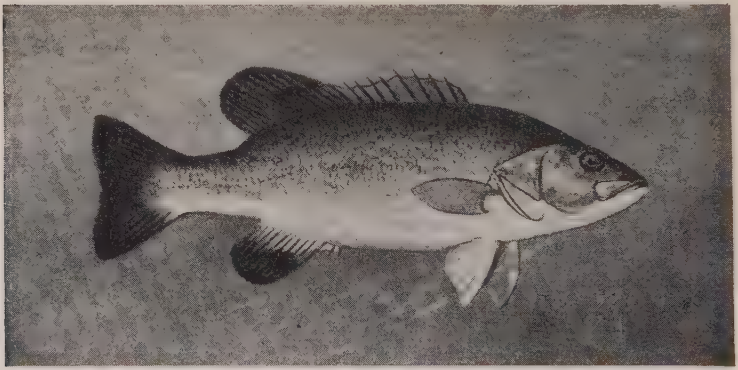
its nest in the bottom near shore as the Bass does. Its bristling spines must furnish considerable protection against attack from such fish as Pickerel, except where these are very much larger than itself.

The Sunfish is a very attractive fish to keep in an aquarium, for which purpose it is well-fitted by small size and sedentary habits. The resplendent yet delicate colors are best developed in the males, and also reflect the moods of the fish. Numerous species of Sunfish abound in the United States, especially in the Mississippi Valley, but none is more truly a living gem than this one.

THE SMALL-MOUTH BLACK BASS

Technical name: *Micropterus dolomieu* (by derivation, "micropterus," from the Greek, small-fin; "dolomieu," in honor of a French mineralogist, for whom the mineral Dolomite is also named). Found in the interior of North America, south to the limit of the clear, cool, fresh waters which it loves. Widely introduced in waters outside the natural limits of its range. Color: dull golden green with a bronze luster more or less mottled with darker and bronze, several stripes radiating from the eye across the side of the head. With very rare exceptions the maximum weight of this fish is six or seven pounds, and there is an apparently well authenticated record of one of nine pounds. Differs from the very similar Large-mouth Black Bass in smaller size, comparatively smaller mouth, somewhat smaller scales, about 17 instead of 10 rows of these on the cheek.

THE Small-mouth Bass is one of the most universally and deservedly popular of American game fishes. At the proper season it will be found equally eager for fly-hook, trolling spoon, or still bait and always ready for a struggle which tests the quality of skill and tackle. In cold weather they retire into the deeper waters of their habitat and become inactive. They spawn in spring, scooping out nests in the bottom close to shore and



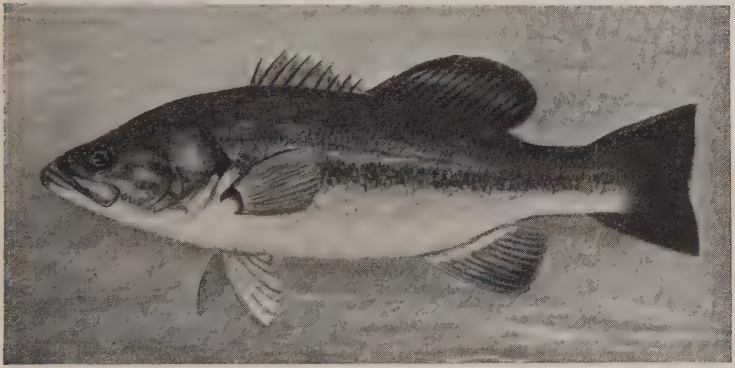
SMALL-MOUTH BLACK BASS

remaining nearby to protect the eggs and young fry. The flesh of the Black Bass is firm, white, and flaky, best adapted to boiling, or frying if the fish be a small one.

THE LARGE-MOUTH BLACK BASS

Technical name: *Micropterus salmoides* (derivation, "micropterus," small-fin; "salmoides," salmon-like). A fresh-water game and food fish distributed over the central and southeastern United States, introduced extensively elsewhere outside the natural limits of its range. Resembles the Small-mouth Bass closely, has a comparatively larger mouth, coarser scales (10 instead of 17 rows on the cheek) and reaches a somewhat larger size. Color: dark greenish, paler below; a conspicuous, black, lengthwise stripe in the young, breaks up into blotches in older fish.

LARGE- and Small-mouth Bass are sometimes found together, but the Large-mouth is satisfied with warmer, less clear waters and replaces the small-mouth species over considerable areas, as in Florida and elsewhere in the South, where it is universally and erroneously known as Trout. The two differ little in habits or in any other respect, and what the Large-mouth must yield in quality to its perhaps more spirited counterpart of clearer waters, it makes up in weight. There is an authentic record of one taken in Florida which weighed 16½ pounds.



LARGE–MOUTH BLACK BASS

The black lengthwise stripe which brands the young of this species of Bass is also characteristic of various Minnows, and little Bass may sometimes be found schooling with such Minnows, and scarcely distinguishable from them—veritable wolves in sheeps' clothing, which grow prodigiously at the Minnows' expense.

The Yellow Perch

Technical name: *Perca flavescens* (derivation, "perca," perch; "flavescens," yellow). A rather small, spiny-finned fish, abundant in ponds and clear, quiet, fresh waters of northeastern America from Canada to North Carolina. Its pointed snout, high back, bearing a banner-like spiny fin, bold black bars, extending half-way down on the more or less yellow-colored body, are familiar to almost anyone who takes any interest in fishes. Rarely exceeds a pound or two in weight, the largest known, 4¼ pounds, taken in May, 1865. The very similar European Perch has reached a weight of nine pounds.

Those for whom sport implies keen excitement and activity will not find it in catching Perch, but as many persons know, there is no better method of whiling away a peaceful summer day surrounded by the quiet waters of, perhaps, the same old pond one has known since boyhood.

YELLOW PERCH

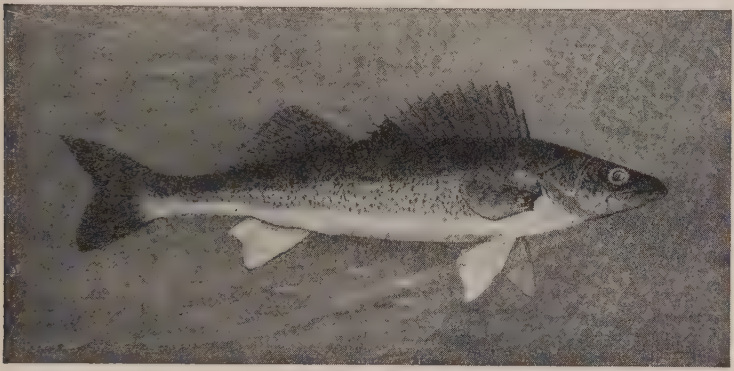
It is a pursuit not altogether lacking the flavor of chance, generally followed for its own sake, yet wherein skill is rewarded at every stage,—to find the fish, to hook them, to land them, and finally, to cook them so that they will impart the maximum of pleasure, not only to the fishermen but to others. Poorly prepared Perch has sometimes been pronounced soft and insipid.

The Perch frequents quiet waters at moderate depths, singly or in schools, going deeper down and becoming inactive in winter. It spawns in the spring. Its food consists of worms, grubs, insects, and the like, and small fishes, even its own kind. Unhook a Perch with great care, as its spines are capable of badly lacerating the hands.

The Wall-Eyed Pike

Technical name: *Stizostedion vitreum* (derivation, "vitreum," glassy, in reference to the large eye). Generally distributed in the fresh waters of North America, especially common about the Great Lakes. An important food fish with ordinary maximum weight of 20 pounds. Combines the slender form and long formidable jaws of the Pike with fins like those of the Perch, to which it is related. Color: dark olive and brassy, mottled, a jet black blotch at the posterior corner of the first or spinous back-fin. The related Sand Pike is smaller, with about 17 instead of 20 rays in the soft back-fin.

Wall-eyed Pike, or Pike Perch, are voracious fish, preying on other lesser species, but said to be no match for the smaller Black Bass which drives the Wall-eye from its grounds. They deposit their spawn in the spring. This fish is taken on rod and reel with minnow bait (slices of fish are as good in swift water) and also with the artificial fly, and is especially delicious boiled. Pike Perch are sometimes caught in winter through the ice. The largest ever taken on rod and reel appears to have been one weighing 13½ pounds, but they reach two or three times this weight.

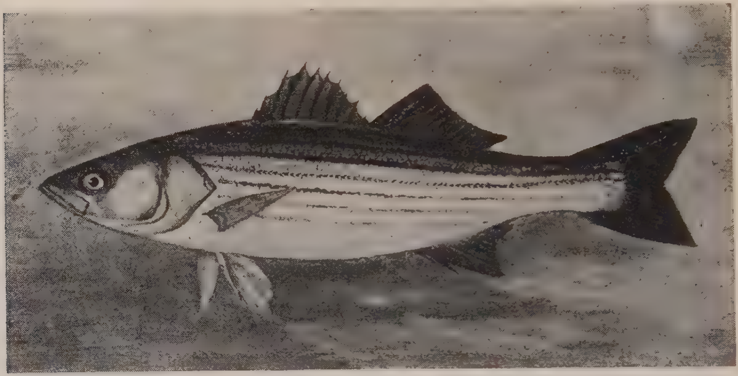


WALL-EYED PIKE

The Striped Bass

Technical name: *Roccus lineatus* (derivation, "roccus," corruption of rockfish; "lineatus," striped). A large Atlantic food fish, also introduced on the Pacific Coast. Reaches a weight of 25, 50 or even 100 pound. The rather large scales are white, those of the back and sides with dark basal spots, which form narrow lengthwise dark stripes on the fish's body, about 7 or 8 in number.

Striped Bass, also known as Rockfish, are a symmetrical, large-mouthed, strong, active fish frequenting the estuaries of rivers, and occurring up stream in pure fresh water, as well as in the brine of the open ocean shore. Most of the grown fish taken nowadays on hook and line are small, being 6 or 7 pounds in weight. It takes especial skill to hook and land the bigger ones, unless by luck. This fish feeds on small fishes, crabs, etc., and may be caught with a variety of baits. Perhaps Striped Bass is our very finest food-fish, white, flaky, and well-flavored. Though more abundant at some seasons than at others, there seems to be no well-marked migration either along the coast or to and from fresh water. It is most numerous, or bites best, in rivers during the spring, and on the sea coast during the fall, but given individuals are probably rather sedentary. Large ones are taken by casting through the surf with rod and line.



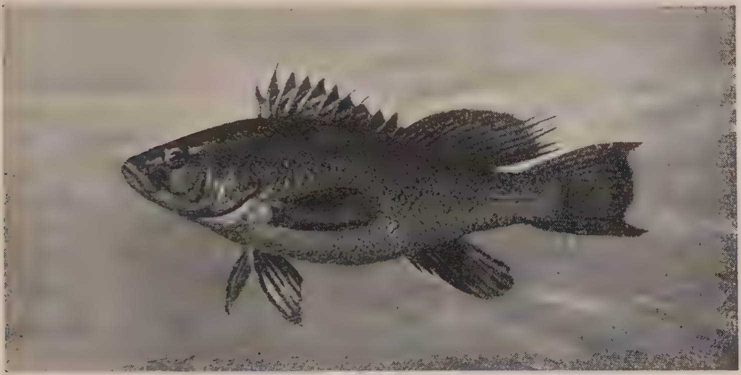
STRIPED BASS

The Sea Bass

Technical name: *Centropristes striatus* (derivation, "centropristes," from the Greek, spine and saw; "striatus," streaked). A salt-water food fish of the Atlantic coast of the United States, south to northern Florida. Color: dark, brownish or bluish-black, finely mottled with pale, scales rather coarse. Large individuals of upward of three pounds usually have humped backs.

Sea Bass is most plentiful on fishing banks a little off-shore in fairly deep water. A bottom-loving and bottom-feeding fish which rarely comes to the surface, it is especially numerous about bits of rock bottom, where, delving among the crevices and loose stones, it finds an abundance of crabs, shrimps, small fish, etc. It is an excellent chowder fish, and delicious boiled or broiled. Sea Bass are more or less migratory, being present off the Middle Atlantic States from spring to late fall. A large-mouthed, voracious fish, not especially active, they are caught for their food rather than game qualities. They take the hook with avidity, and have a tough leathery mouth, so that, when once hooked, they are not easily lost. The young of the year, with a dark, lengthwise stripe, are abundant in coastwise bays in autumn. The record weight appears to be 8 pounds 2 ounces.

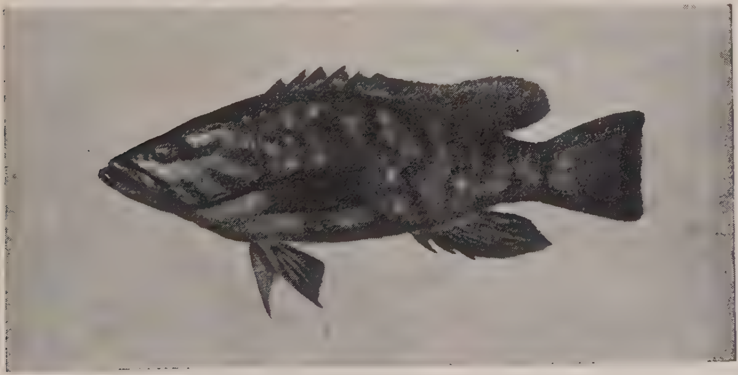
This is the most northerly representative of the many Sea Basses found further south variously known as Groupers, Rock-fish, etc., fishes of similar habits, some of them reaching a very large size, and many of them of considerable commercial importance.



SEA BASS

The Jew Fish

Technical name: *Promicrops guttatus* (derivation, "promicrops," from the Greek, in front of—small-eye, a reference to the shape of the skull; "guttatus," spotted). A giant Sea Bass found on warm shores, common among the Florida Keys. The head and back are very broad; the front of the back-fin consists of eleven short stout spines; the



JEW FISH

tail-fin is rounded. Color: brownish, with conspicuous round dark spots above, most numerous on the head; most of the spots lost with age. There is a record of an individual weighing 400 pounds taken in Florida on rod and reel. Reaches a still larger size.

One thinks of the big Sea Basses as haunting some lonely off-shore ledge deep down in the cool shadows under the blue-green water. In the Bay of Florida, however, one may find the Spotted Jew Fish in water barely deep enough for it to swim, its color resemblance to the bottom, or the frequently muddy water, alone giving it some slight protection. But in the pitiless glare of the blazing sun, it becomes a ready target for the hand-thrown harpoon. It is solitary in its habits, and an ever-present source of danger to the smaller fishes which thread the narrow passages between the Keys.

The Red Grouper, a related fish which reaches a weight of 40 or 50 pounds, is one of the most important southern food fishes. It is olive gray or brown in color, variously clouded and mottled, the jaws and lower part of the sides of the head and breast being more or less salmon-colored. In large examples these parts become flesh-red, which color also pervades the entire fish to a greater or less degree.

Courtesy of New York Zoological Society

RED GROUPER
From a photograph by E. R. Sanborn

The Red Snapper

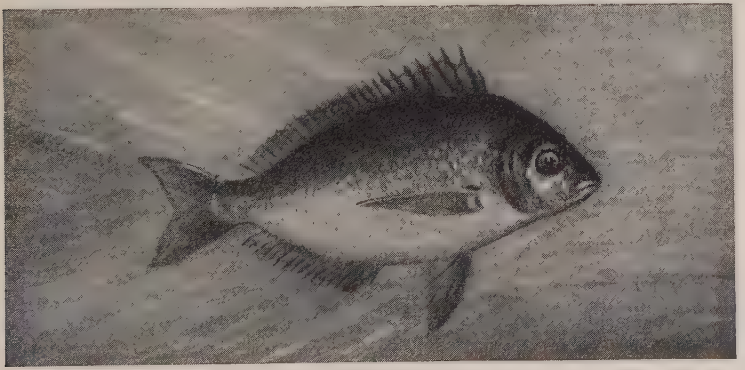
Technical name: *Neomaenis aya* (derivation, "neomaenis," new maenis, maenis the name of a related but dissimilar fish; "aya," from the Portuguese name). An important salt-water food fish, from the Carolinas to Texas, straying further north, and found south to Brazil. A symmetrical, active, spiny-finned fish, with large mouth, eye, and scales, and a long slanting snout. Color: red, a rather small dark blotch on the side, most noticeable in the young.

Of the many southern species of Snappers, the Red Snapper is the one which regularly finds its way to the big fish markets of the north. A fine large Red Snapper, baked, is unsurpassed for the table. This species resembles others of its kind in appearance and habits, but is commonly found under a greater depth of water than are those which are not red. Various deeper water members of the Snapper Family are thus red in color, in fact we find such red color cropping out in quite unlike groups of fishes as they descend below the ocean's surface. The tendency may be correlated with the blue-green character that daylight must acquire in penetrating to them. Truly deep-sea fishes which live beyond the zone of daylight penetration are apt to be blackish and show no such red tendency.

Gray or Mangrove Snappers are one of the most familiar fishes in the Tropics and sub-Tropics. Looking down through the clear water one may see them in small schools, one following the other, as they glide leisurely across the stretches of white sand or skirt the edges of the mangroves. They are a vigorous, gamy fish, preying on other smaller species, but wary, difficult to hook or to play among the mangrove roots, and of less food value than other abundant Snappers found in deeper water.

The Porgy, or Scup

Technical name: *Stenesthes chrysops* (derivation, "stenesthes," narrow, to eat [i. e., teeth]: "chrysops," gold-eye; both from the Greek). A small, perch-like salt-water fish. Abundant on the Atlantic coast of the United States, south to Cape Hatteras; excellent



PORGY

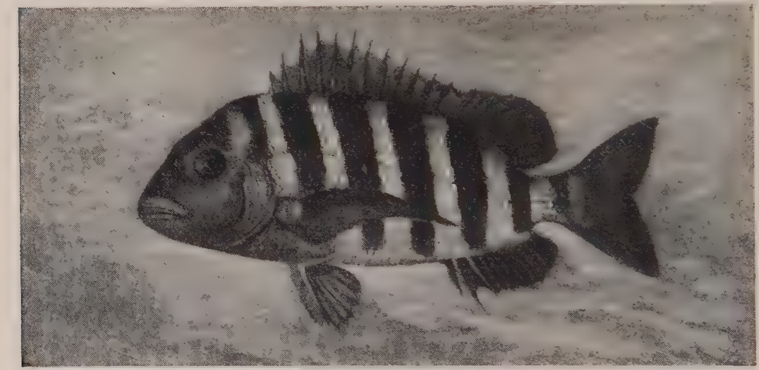
for the frying pan. Color: brownish, somewhat silvery below with bright reflections everywhere and with no distinct markings, though there are vague dark cross-shades which come and go and at times form pronounced bands.

Porgy, or Scup, are a migratory fish, found in the vicinity of New York City only in the summertime. They bite readily on a variety of bait, and sometimes can be caught in our bays in large numbers. This species is the most northern representative of a large southern family, all of which are valued as food.

The Sheepshead

Technical name: *Archosargus probatocephalus* (derivation, "archosargus," chief sargus, sargus an old name for a related fish; "probatocephalus," from the Greek, sheep-head). A salt-water food fish of the Atlantic United States, from Cape Cod to Florida and the Gulf Coast. Averaging 6 and growing to 12 or 15, occasionally 20 pounds, in weight. A deep-bodied, spiny-finned, perch-like fish, with prominent, flat, sheep like biting teeth, and five or six conspicuous broad black bands extending downward across the body.

Several decades ago Sheepshead were abundant from Cape May, New Jersey, to Montauk Point, but they have now become scarce in this northern portion of their range. Just what has caused this decrease is not clearly understood, though over-fishing may well have been the chief factor, for the northern Sheepshead has been much sought after. Taken in this vicinity, this species is generally conceded to be one of the very finest food fishes, but in the south it is not much thought of, being, indeed, comparatively dry and tasteless.

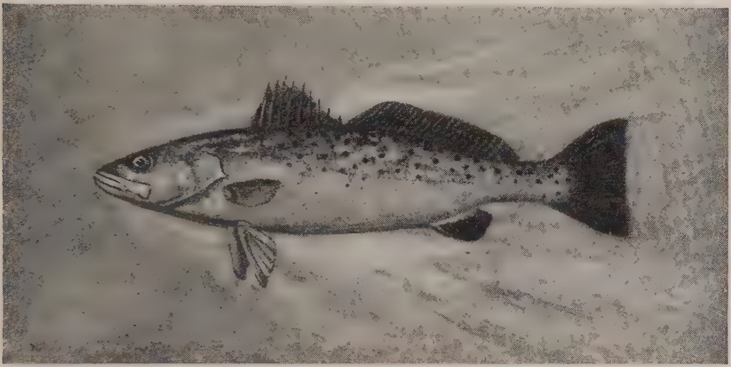


SHEEPSHEAD

The Spotted Sea Trout

Technical name: *Cynoscion nebulosus* (derivation, "cynoscion," dog-sciaena; "nebulosus," clouded). An important southern salt-water food fish of sandy shores, rarely found north to New Jersey; weighing from 2 to 10 pounds. Color: sides silvery, back and tail with small, conspicuous black spots.

HOWEVER inappropriate, the name Trout is too firmly fixed for this fish to be uprooted. The colonists of the Carolinas knew that Trout were excellent, beautiful, spotted fish. The warm streams of the region held no true Trout, and this species of the Drum Family, scarcely distinguishable from the northern Weakfish, save by the presence of spots, early acquired the name and has held it ever since. The Sea Trout is very abundant, certainly the equal of the northern Weakfish in flavor, and shipped in quantity to the large markets of the north. It swims in schools, migrating north and south along the coast with the changing seasons, and preys voraciously on small fishes, shrimps, etc.



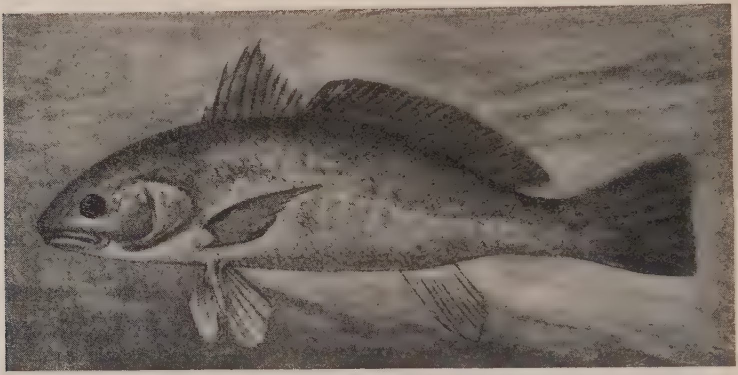
SPOTTED SEA TROUT

THE CHANNEL BASS

Technical name: *Sciaenops ocellatus* (derivation, "sciaenops," from sciaena and eye; sciaena was the ancient name of a similar fish; "ocellatus," having eye-like spots). A large salt water food fish, found on South Atlantic and Gulf Coasts, common in summer north to New Jersey. Elongate, length 2 to 5 feet, weight 10 to 75 pounds. Color: grayish-silvery, often washed with reddish, a conspicuous black eye-like spot at the base of the tail-fin above.

CHANNEL BASS seems the best established of the many popular names which have been applied to this fish, Spotted Bass, Red-fish, Red Drum, etc. This is unfortunate, as it belongs not to the Bass but to the Drum Family, food fishes of warm, temperate, usually sandy shores, with a comparatively short, spiny back-fin, followed by a long soft-rayed fin upon the posterior part of the back. Nearly all the fishes of this family have the power of uttering loud sounds by means of a peculiar structure of the air bladder.

It is mostly a bottom feeder, crabs, eels, small fish, etc., comprising its diet. A thoroughly game fish, seldom skulking, making long vigorous runs, and not giving up the fight till it is over; it is the greatest prize of the surf fisherman, who stands on the beach and casts far out into the breakers with heavy rod and line. Channel Bass seem not to have occurred on the New Jersey Coast previous to 1880, and are thus listed among several species which have apparently extended their range northward for some unknown reason within recent times.



CHANNEL BASS

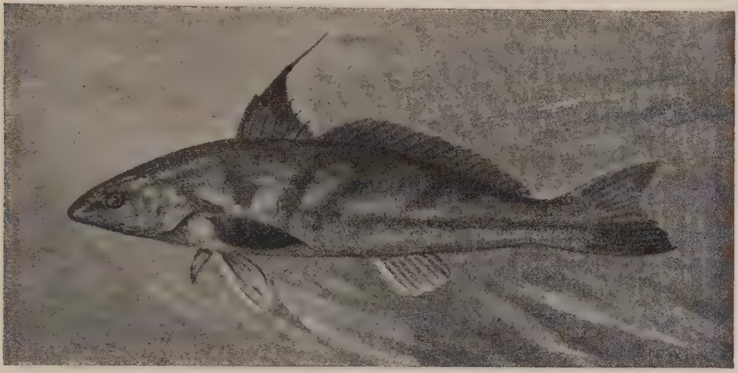
THE KINGFISH, WHITING, OR BARB

Technical name: *Menticirrhus saxatilis* (derivation, "menticirrhus," chin-thread; "saxatilis," of the rocks). A delicious salt-water food fish averaging two or three pounds in weight; found along sandy beaches from Cape Cod to the Carolinas and locally further south. Form slender; a short pointed spinous fin on the back, followed by a much longer one of soft rays. Snout pig-like and projecting, chin with a single fleshy barbel, tail-fin rounded. Dark bars extend downward and forward slanting across the fish's sides.

"KINGFISH," is the name used for this fish about New York City, and Barb in the vicinity of Barnegat Bay, New Jersey, whereas in the South it shares "Whiting" with two other very similar but less boldly striped species. Care should be taken not to confuse one's ideas of it with those concerning the very different Kingfish of Florida, which is a swift offshore mackerel, like the Spanish Mackerel, but larger, unspotted, and coarser fleshed.

For its size the Kingfish is a game fighter. As it strikes it usually goes to the bottom, but on feeling the pressure of the line makes long zig-zag runs, and fights until landed, like its large relative, the Channel Bass; for the Kingfish is also a member of the Drum Family.

The simplest derivation from the all-round perch- and bass-like fishes is a line of wider-ranging, freer-swiming forms, through such species as the Bluefish to the Mackerels.



KINGFISH

The Bluefish

Technical name: *Pomatomus saltatrix* (derivation, "pomatomus," from the Greek, operculum-cutting; "saltatrix," jumper). A salt-water food fish of the Atlantic and Indian Oceans, reaching an ordinary maximum of ten pounds. Mouth large, the lower jaw projecting; form symmetrical; scales small; tail-fin forked. Color: blue-green above, sides silvery, white below.

Bluefish are a strong, swift-swimming, voracious species. They travel in schools and are tremendously destructive to smaller fishes, especially the Menhaden on the coast. In the summer they occur northward beyond Cape Cod, and are migratory along most of the Atlantic coast of the United States, though present throughout the year southward. In the ocean off the Middle Atlantic States and Southern New England this fish affords fine summer sport trolling from sail-boats, with shiny metal "squid" in place of any bait. The young are very abundant in in-shore waters in late August and early September, and extensively fished for with light tackle, going under the name of Snappers.

The Dollar or Butterfish

Technical name: *Poronotus triacanthus* (derivation, "poronotus," referring to the series of pores along its back; "triacanthus," from the Greek, three-spine). A small salt-water fish abundant on the eastern coast of the United States. A delicious pan-fish, attaining an average size of seven or eight inches. Color: bright silvery.

When the northwest winds of autumn blowing from the land flatten the ocean surface to a dazzling sheet of uniform blue in the sunlight, and the low ground-swell breaks short on the beach, one may see schools of small pale fishes darting about just outside of the foam and clouds of sand raised in the water by the breaking surf. These are Butterfish. Perhaps they have ventured in thus far to escape some larger predacious species or to feed on the amphipod crustaceans abundant along the water's edge. When the surf is just right, one or two of their number are sometimes left out of water by a receding wave, flapping on their flat silver sides until they are able to escape into the advancing foam from the succeeding one.

BUTTERFISH

Butterfish are taken in very large numbers by net and trap fishermen, but are not caught with hook and line. Their flesh is at times infested with a parasitic worm which prevents almost an entire catch from being marketed.

The Yellowtail

Technical name: *Seriola dorsalis* (derivation, "seriola," Italian name of the Atlantic Amber Jack; "dorsalis," pertaining to the back, a reference to the long back-fin). A good sized salt-water food fish of California and the Pacific coast of Mexico. Highly prized by rod-and-reel anglers about the islands off Southern California, where it is abundant in summer. A symmetrical, slender, swift-swimming off-shore fish with a deeply-forked tail-fin which is yellow in color. Color: bright steel-blue on the back with dull silvery sides flushed with yellow in the middle. Young with about 10 indistinct dark bands

The largest Yellow-tail of which there is record was taken with rod and reel at Santa Catalina Island. It weighed 60 pounds 8 ounces. This is comparable with, though smaller than, sizes cited for the Great Amber Jack of the Atlantic, said to reach a length of five or six feet and a weight of 100 pounds. Several of the Amber Jacks, of which the Yellowtail is one, reach a large size. They are fishes related to the Crevallies, and resembling them somewhat in habits, but without the enlarged keeled scales on the narrow part of the tail, or peduncle. When young they have dark cross bands, and also the habit of accompanying pieces of driftwood, weed, or the like. In the smaller kinds the bands are usually most pronounced, as also this habit, and these frequently accompany boats or coastwise sharks. We have here, less developed, a tendency toward the mode of life of the very similar Pilot-fish of the high seas, which never loses its black cross bands and regularly accompanies ocean-going Sharks throughout the warm seas of the world.

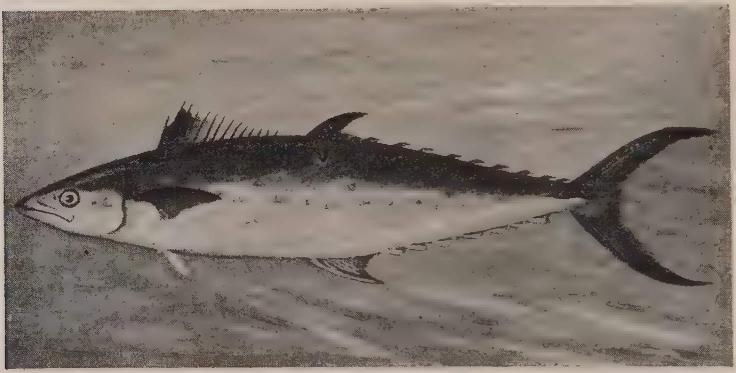
YELLOWTAIL

The Spanish Mackerel

Technical name: *Scomberomorus maculatus* (derivation, "scomberomorus," near scomber; scomber was the ancient name of the Common Mackerel; "maculatus," spotted). A swift-swimming, warm-water sea fish, reaching 8 or 9 pounds in weight; north in late summer, and fall around Cape Cod. Bluish or greenish above, with silvery sides, marked with elliptical, dull orange spots.

This is one of the most highly-prized food-fishes, rich, fine-grained, and delicate. Blue-fishermen sometimes catch them trolling in the ocean with metal squid off the Middle Atlantic States. Large quantities are shipped to northern markets from Florida in winter. When about March first the breeze blows in across the Gulf Stream bringing a touch of summer to the Keys, a school of Spanish Mackerel, their graceful forms appearing bright translucent green in the sun as they cut the surface of the waves for a bare instant, makes a scene of marvelous beauty.

About Cuba the Spanish Mackerel is replaced by a slightly different fish with more regularly arranged spots, the Pintado. This latter has a questionable reputation, being reputed at times poisonous. At one time "Spanish Mackerel" was current for a different species, now known as Chub Mackerel. In maritime usage the adjective "Spanish" has something the meaning of strange or unfamiliar, having been rather freely and indiscriminately used by English-speaking seamen, who superseded the old mariners of Spain, for things they did not know much about.



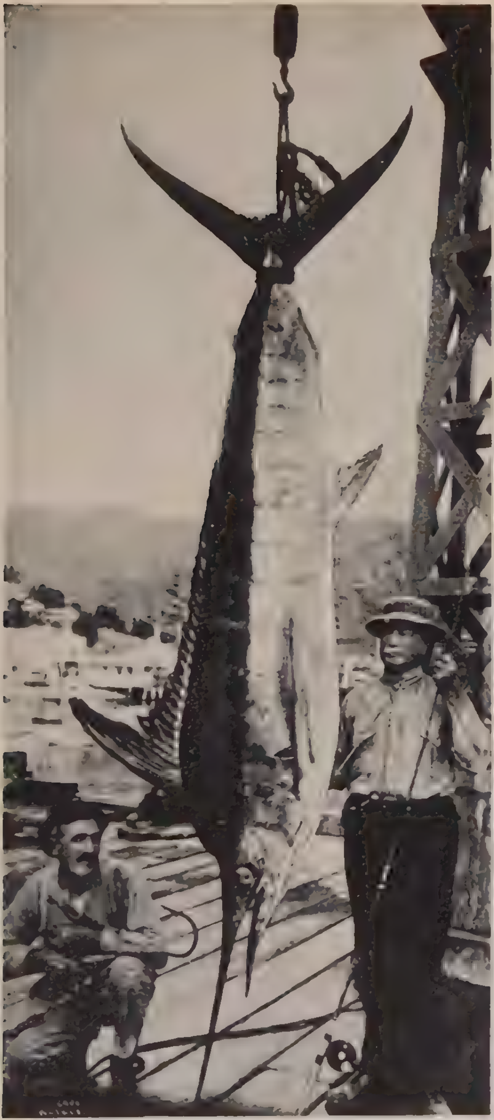
SPANISH MACKEREL

The Swordfish

Technical name: *Xiphias gladius* (derivation, "xiphias," from the Greek, sword; "gladius," from the Latin-sword). A gigantic sea fish, found in all warm oceans, visiting temperate shores in summer. Reaches a weight of about 1,000 pounds. Its spindle-shaped body propelled by a powerful crescentic tail-fin. The upper jaw produced in a long flat sword-shaped weapon. The eye is very large. A food fish of importance. Color: more or less purplish, darker above.

There is an extensive fishery for Swordfish in the vicinity of Block Island, and beyond to the eastward. These great creatures are found swimming lazily at the surface of the summer sea, the high back-fin and upper fluke of the tail projecting into the air, and are harpooned from sailing vessels especially rigged for the purpose. Their meat is white and fine-grained, resembling Halibut somewhat, but much perferred to it by many persons. Swordfish are said to attack Sharks with their sword. There are many

Courtesy of American Museum of Natural History



MARLIN SWORDFISH

instances of their driving it deep into the bottoms of ships. Ambitious anglers of Southern California sometimes take the mighty Swordfish with rod and reel, and more often so capture the related Japanese Spearfish, which has a shorter cylindrical weapon, and is locally known as Marlin Swordfish as contrasted with Broad-bill Swordfish. The Sailfish of the Gulf Stream off the east coast of Florida is a third related fish with high banner-like fin extending along the back, depressible into a groove there situated.

Starting with the somewhat perch-like Wrasses, a line of fish evolution may be followed to such peculiar species as the Swellfish. Spiny-headed Sculpins, soft-finned, cod-like fishes, and unsymmetrical Flatfish are recent developments with a long history and uncertain ancestors.

The Blackfish or Tautog

Technical name: *Tautoga onitis* (derivation, "tautoga," from tautog). An important Atlantic Coast salt water food-fish, ranging south to the Carolinas. Maximum weight 10 pounds, with rare exceptions; a 22½ pound fish taken in 1876.

Blackfish, or Tautog, swim close to the bottom, preferably about rocks. The stout teeth are well fitted to crush such shelly creatures as crabs of various kinds, small lobsters, clams, barnacles, etc., which compose their diet. Old sunken wrecks, which abound with food of this nature, are favorite spots to angle for Blackfish.

The Blackfish and the smaller, slenderer, coarser-scaled Cunner which swarm along the rocky shores of New England, are northern members of a tropical family, the Wrasses.

The California Redfish

Technical name: *Pimelometopon pulcher* (derivation, "pimelometopon," from the Greek, fat-forehead; "pulcher," beautiful). A large, brightly-colored salt-water food fish of the Southern California coast belonging to the Wrasse Family. The forehead in large fish with a prominent fatty hump. The colors of the adult male are peculiar, black at both ends and usually more or less bright red in the middle; females are more uniformly dusky-rose colored.

California Redfish, which are also known as Fat-head, are found in great abundance a short distance from the shore, where the long strands of kelp rise from the bottom to form a sheltering mat on the surface which parallels the coast in a long yellow band, and along which strings of

California Brown Pelicans go flapping by, and inside of which the water is comparatively smooth. This fish reaches a length of three feet, a weight of 12 or 15 pounds, and is taken chiefly by the Chinese with hook and line.

CALIFORNIA REDFISH

SWELLFISH, PUFFER, OR BLOWFISH

Technical name: *Spheroides maculatus* (derivation, "spheroides," resembling a sphere, "maculatus," spotted). A small, inactive salt-water fish, with a high back, and the teeth forming a bony beak in the small circular mouth. Skin without scales, roughened with minute prickles. Color: grayish or brownish, with several indistinct vertical dark marks on the sides and a whitish belly. Abundant from Cape Ann southward. The young in shallow water close to the shore. Numerous species of Swellfishes occur southward.

THE skin covering lower parts of the Swellfish is very elastic, and it has the power of inflating the body with water or air until it assumes a spherical form of twice or more its usual size. The habit is probably of service in discouraging larger fish by which it may be attacked. There are numerous cases of serious poisoning resulting upon eating these fish. The poison seems to be more or less localized in the viscera and to permeate the rest of the fish if it has been dead any length of time.

THE LONG-SPINED SCULPIN

Technical name: *Myoxocephalus octodecimspinosus* (derivation, "myoxocephalus,' from the Greek, dormouse-head; "octodecimspinosus," eighteen-spined). A small salt-water fish with a big spiny head found on the Atlantic Coast of the United States, south in winter abundantly to the latitude of New York.

NUMEROUS species of salt-water Sculpins occur on northern, usually rocky coasts. They are one of the few types of fish abundant along the shores of the ice-locked Arctic Ocean. Sculpins keep on or close to the bottom, which their mottled colors match admirably, taking full advantage of this concealing resemblance by remaining motionless, and progressing by occasional rapid movements. When fresh from the water, with the big spiny head removed, what is left of a Sculpin is good eating, but they are seldom used for food.

Courtesy of New York Zoological Society

LONG-SPINED SCULPIN

From a photograph by E. R. Sanborn

The California Whitefish

Technical name: *Caulolatilus princeps* (derivation, "caulolatilus," stem-latilus, latilus being a related fish; "princeps," leader). A salt-water food-fish reaching a length of between three and four feet. Found along the Pacific coast of America from California into the Southern Hemisphere. Elongate in form, the depth about one-fourth of head and body, soft (posterior) portion of the back-fin, and anal fin (below it), long,

CALIFORNIA WHITEFISH

of numerous rays. Color: olivaceous, more or less brown along the back, paler with bluish reflections on the sides.

California Whitefish may perhaps better go under their Spanish name of Blanquillo, as they are in no wise related to the Whitefishes of the Great Lakes and other fresh waters of America. This species is a food-fish of considerable importance, most abundant about rocky Pacific Islands. The first naturalist to encounter it was Darwin, who collected it in the Galapagos Islands, during the memorable voyage of the "Beagle."

The Blanquillo is a member of the large group of so-called trachinoid fishes, which are rather poorly represented on the coasts of North America. The related Tilefish, from deep water at the edge of the continental shelf in the Atlantic, is an important food fish in the east, having a firm, sweet meat, something like Haddock. It is a very handsome species, profusely spotted with bright yellow.

The Cod

Technical name: *Gadus callarias* (derivation, "gadus," the Latin name, allied to the English cod; "callarias," an old name for the species). A large salt-water food fish of northern seas. Three separate soft-rayed back-fins. Lower jaw a little shorter than the upper, with a fleshy barbel at the chin. Color: generally greenish, mottled with paler, but very variable. The lateral line situated in a narrow white stripe. The largest Codfish on record was over six feet long and weighed 211½ pounds.

Courtesy of American Museum of Natural History

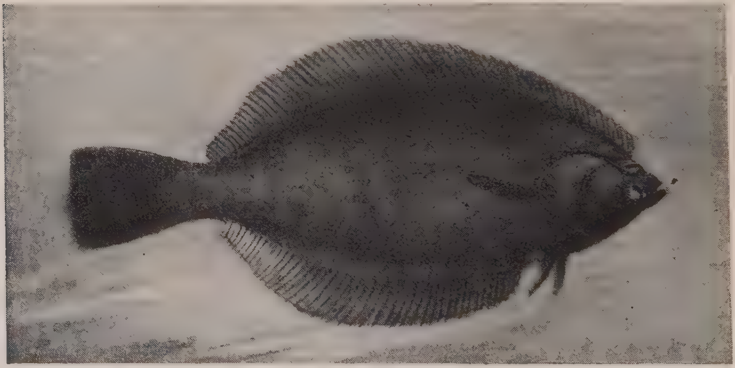
EUROPEAN POLLACK

Cod swim in large schools, often under considerable depth of water, usually not far from the bottom. They are voracious and almost omnivorous. Few living objects of suitable size in their habitat which possess any food value, but sooner or later find their way into the roomy interior of the Codfish. Cod are migratory, extending considerably further south along the coast in winter than in summer. Though common enough along the shore, the greatest number are found on off-shore banks. Relatives of the Cod, frequently caught with it in Atlantic waters, are the somewhat smaller "smaller-mouthed Haddock," with pointed first back-fin and lateral line running in a black stripe, and the more active, trimmer-built Pollack, which usually swims higher in the water and in which the lower jaw is slightly longer than the upper, the tail-fin slightly forked. Cod is probably the most important, commercially, of any salt-water fish. As a general food fish it is superior to these other two, though the Haddock, which has a tendency to be too firm and dry, is unsurpassed as the basis for a chowder, and the Pollack is especially delicious cooked with fat pork.

THE WINTER FLOUNDER

Technical: *Pseudopleuronectes americanus* (derivation, "pseudopleuronectes," false-pleuronectus, pleuronectus being a kind of flounder, from the Greek, side-swimmer; "americanus," American). A salt-water food fish of the northeastern United States, reaching a pound or two in weight. Dextral, that is, the right side uppermost, and colored, with rather small and twisted mouth. Color: brownish or slaty-gray, with inconspicuous brick-red spots.

FLATFISHES, for most of the smaller species of which the name Flounder is loosely used, are among the most peculiar and interesting of fishes structurally. From the habit of lying on the bottom on one side they have become much flattened, with color on the upper side only, and the eye which would naturally be situated on the lower side is found on the upper side close beside the one which belongs there. They are very inconspicuous lying on the sand or mud of the bottom, in which they



WINTER FLOUNDER

often partially bury themselves, and further have considerable power of changing the colors and markings of the upper side to match the particular bottom on which they are resting.

The Winter Flounder reaches the southern limit of its residence the year round, near the latitude of New York City. It runs up the bays and into the mouths of estuaries to spawn late in the fall and early in the spring, and is then taken in quantity by enthusiastic hand-line fishermen, earlier and later than other bay fish are in season.

OUT FISHIN'

By HARRY LEE BURGESS

A FELLER isn't thinkin' mean,
Out fishin';
His thoughts are mostly good and clean,
Out fishin';
He doesn't knock his fellowmen,
Or harbor any grudges then;
A feller's at his finest, when
Out fishin'.

"The rich are comrades to the poor,
Out fishin';
All brothers of a common lure,
Out fishin';
The urchin with the pin an' string
Can chum with millionaire an' king;
Vain pride is a forgotten thing
Out fishin'.

"A feller gets a chance to dream,
Out fishin';
He learns the beauties of a stream
Out fishin';

An' he can wash his soul in air
That isn't foul with selfish care
An' relish plain an' simple fare
    Out fishin'.

"A feller has no time for hate,
    Out fishin';
He isn't eager to be great,
    Out fishin';
He isn't thinkin' thoughts of pelf,
Or goods stacked high upon a shelf,
But he is always just himself,
    Out fishin'.

"A feller's glad to be a friend,
    Out fishin';
A helping hand he'll always lend,
    Out fishin';
The brotherhood of rod an' line
An' sky and stream is always fine;
Men come real close to God's design,
    Out fishin'.

"A feller isn't plotting schemes,
    Out fishin';
He's only busy with his dreams,
    Out fishin';
His livery is a coat of tan,
His creed, to do the best he can;
A feller's always mostly man,
    Out fishin'."

FISHING TIPS

By GEORGE M. JOHNSON

OF ALL forms of outdoor sport, beyond a doubt angling is the most popular. Wherever there is water, whether a trout brook tumbling down a mountainside, a muddy creek inhabited only by bullheads, or the blue waters of a lake, you can usually find some enthusiastic fisherman hard at it, his heart filled with satisfaction if the fish are biting, and with hope for the future if they are not; for the true angler is the most optimistic person alive. Whatever ill luck has been his in the past, he is always confident that the next hour or so cannot fail to show a change for the better.

Angling affords many joys aside from the mere pleasure of catching fish. What could be more enjoyable, for instance, than a morning on a trout stream in early spring? It seems so good to be in the woods again after the cold and discomforts of winter! Here the angler comes across a tiny cluster of trailing arbutus, with its sweet, spicy odor; just beyond a song sparrow is perched on a twig pouring forth a melody of thanksgiving; while even the skunk cabbage bursting from the ground in a marshy spot by the brook possesses a sort of beauty. Decidedly the person who never angles is to be pitied.

To get the limit of pleasure out of fishing the outfit must be selected with due care. As a usual thing, most anglers are specialists; that is, they own several rods, lines, and reels, each of which is designed for a certain type of fishing. To illustrate: two popular forms of angling to-day are fly casting and bait casting; they are as different as day and night, and to a man going bait casting for black bass, a fly rod would be of no more use than a pump gun. However, many youthful anglers cannot invest money enough to branch out in this way, and one of the purposes of the writer will be to suggest a general outfit which will cover a wide range of angling possibilities.

Obviously the choice of a rod should be determined by the sort of fishing found in the locality where the angler lives. If he is to fish mainly for trout he ought to own a fly rod, preferably of split bamboo, about eight and one-half feet long and weighing in the neighborhood of five ounces. Such a rod can be used both in bait and fly fishing for trout, and will also be serviceable for any stream or pond angling where the fish do not run to large size. I often use my pet trout rod for perch, croppies, and small bass or pickerel.

Avoid the cheap split bamboo rod as you would poison ivy. Good rods of wood—lance-wood, greenheart, etc.—are cheaper to make than those of split bamboo, and hence will cost somewhat less.

If it is a question of economy, which must be considered, a steel rod might be selected; and while a steel fly rod cannot give you the light, smooth action found in one of split bamboo or wood, it will none the less deliver the goods in a highly satisfactory way, making an ideal all-round rod for anyone who is not over particular.

If the angler expects to pursue fish running to good size—pickerel, pike, big-mouth bass, and the like—he would better select a bait rod about eight feet long and weighing seven or eight ounces. For live-bait fishing or trolling no material will answer better than steel. Such a rod will stand the hardest kind of use, is very unlikely to break, and with proper care will last almost indefinitely.

Before leaving the subject of rods let me add a few words

Courtesy of Western Pacific Railway

"WHO SAYS THEY AREN'T BITIN'?"

with regard to bait casting, a highly specialized form of angling that has become tremendously popular within the past fifteen or twenty years. A stiffish rod five to six feet long is used, and the bait, generally some variety of spinner or wooden "plug," is reeled in till it almost touches the end of the rod, whereupon the angler casts it with about the same motion you would employ in throwing an over-ripe apple off a pointed stick. As the lure sails away, the fisherman controls it by a light pressure of his thumb on the spool of the reel. After the cast is completed he reels the bait in, the motion thus imparted to it attracting the bass, pickerel, or other fish into striking.

The bait casting rod can be used for nothing else, with the possible exception of trolling; but this type of fishing is so effective that every angler's outfit should include one. A good bait casting rod of split bamboo will cost as much as a high grade fly rod, but there are some mighty fine steel casting rods on the market at reasonable prices.

You will find as many different lines to choose from as rods, but for our all-round outfit we shall consider but two. For most kinds of fishing the enameled silk fly casting line is best. As its name implies, this line has a hard, smooth finish, which makes it pass through the rod guides easily—a very important matter. It is not only intended for fly casting, but for bait fishing as well, so that on a trout stream the angler can fish with such baits as worms, grasshoppers, or minnows, and then if so desired switch to artificial flies without changing his line. The size should depend on the weight of the rod which is to handle it, but for average use I would recommend size E or F.

Our second line is made of soft or raw silk very tightly braided, and will prove highly unsatisfactory for average fishing, so don't buy it unless you plan to tackle the gentle art of bait casting. In any case, remember not to specify merely a casting line, for you may get the wrong article.

There are two casting lines, bait and fly, and you will make but a sorry mess of your fishing efforts if you attempt to use one for the other.

Now for our reel. Only one type of fishing demands a high-grade reel, and that is bait casting, which calls for a quadruple multiplier (the spool revolves four times to each turn of the handle, this being necessary to give the bait sufficient speed through the water), and it must spin freely and easily. A bait casting reel will answer for other forms of fishing, and accordingly if the outfit is to boast but one reel, let it by all means be of this kind. However, for ordinary fishing, a simple, inexpensive click reel will prove quite satisfactory.

Our outfit should include a line of artificial lures, of which there are hundreds on the market. For pickerel, the old-fashioned nickel-plated fluted spoon has always been a favorite with me, and it is nearly as effective for bass as pickerel. If the spoon is too light to cast readily, wrap one or two thin strips of lead about the shaft; then test to see that it spins readily, for the added weight may possibly have thrown the lure off balance. It is a good plan to have several of these baits of different sizes in the outfit. The smaller one with spoon about three-quarters of an inch long is fine for perch, croppies, and other small fish. The pickerel size should be about two inches long.

The bait caster ought to have at least a half-dozen assorted lures, including those that float on the surface and those that dive, and the color should vary. For dark days and evening fishing, use the light-colored patterns, while for sunny weather the darker ones are usually more killing. It is well, also, to include one so-called weedless bait, for if the weeds and lily pads are at all thick the ordinary lure will quickly pick up enough vegetation to ruin its appearance in the water.

Little need be said concerning hooks, as the size and pattern will depend largely on the angler's individual preference. For trout and other small fish, use single-snelled hooks; for bass, double snell is better. Twisted snell should be used for heavy fish with very sharp teeth, such as members of the pike family. A five-pound pickerel might easily fray a double snell through before he was subdued, and for this reason some anglers prefer wire snell for such fishing.

If the opportunity permits, by all means make an attempt at fly casting. Trout and bass are the fish most commonly taken this way, but most members of the finny family will rise to artificial flies more or less freely. For trout, select two or three of each of the following patterns tied to No. 8 or No. 10 hook: coachman, royal coachman, brown hackle, gray hackle, cow dung, grizzly king, queen of the water, professor, and black gnat. There are many other killing patterns of trout flies, but the chances are that if the fish are feeding at all they will take one or more of the above. Have several three-foot leaders with dropper loop, so that two flies can be used at once, and an inexpensive leader box containing felt pads for soaking the gut before fishing. Snell will crack if used dry.

Perch, croppies, sun fish, and others will take the larger and more gaudy patterns of trout flies, and trout flies tied to No. 6 hook are excellent for small-mouth bass running up to a pound or two. For large bass, get the regulation bass flies, including such patterns as parmachenee belle, red ibis, Montreal, grizzly king, royal coachman, governor, etc. There are some so-called "bass bugs" on the market, light enough to be cast with a fly rod, which are reported to be good medicine.

After a fishing outfit is selected the next most important thing is to take proper care of it. A good rod may last a lifetime, and then again it may be ruined after a single season's use, and this is particularly true of so delicate an article as a light fly rod. Be careful not to hit your fish too hard when he strikes. If it was a small chappie, no harm may be done, but if one of the big fellows has sampled your lure, a vicious yank may not only smash your rod but lose the fish to boot. Also be careful when working through brush not to catch your rod in the bushes or on the limb of a tree. It is far better, if you have to travel far through hard going, to disjoint the rod. You will really save time, for the fact that you can travel so much faster will more than offset the few minutes spent in disjointing the rod and putting it together again.

Don't lay your rod on the ground where some careless member of the angling party might step on it, and on the other hand don't lean it for very long against a tree; it is bound to be bent more or less, and may acquire a permanent set. When not in use a fly rod should always be kept in the wooden form. Do not leave your rod exposed to dampness. Of course, the varnish is supposed to render it waterproof, but the bronzed steel guides will rust, and the damp may get at the wood in spite of the protecting varnish.

Every three or four seasons, depending upon how hard it is used, a split bamboo rod should be overhauled. When thoroughly done, this is quite a chore, for it means a complete rewrapping and varnishing, together with replacement of all worn guides. Scrape the varnish off with a dull knife, being careful not to mar the wood in any way. The guides will go on first, and assuming that they were properly spaced originally they can be replaced in the same positions, which may be assured by marking the locations with a lead pencil as the guides are cut off. However, in case the joint has acquired a set, the guides can be wrapped on so as to reverse the strain in fishing, and the rod will quickly straighten up.

The wrappings are usually of red and green silk alternating, though other colors are occasionally used, and a bit of planning is necessary to make the colors and spaces come out even. The windings themselves should be narrow and not more than an inch apart. Do your winding over a separate piece of looped thread, and after the wrapping is complete pass the thread end through this loop, which is then pulled tight and the end cut. A safety razor blade, with a bit of adhesive tape around half of it for a handle, makes an ideal knife for clipping the thread.

When your rod is fully wound give it two coats of color preservative, a substance obtainable in any well-equipped tackle store. If you varnish the rod without taking this precaution the bright colors of the silk will be so deadened that you might as well have used black thread, as far as appearance goes. Use only the highest grade of special rod varnish; ordinary varnish will not do, since it is not elastic, and will crack when the rod is used. Apply one coat, allowing plenty of time for it to dry in a place absolutely free from dust, after which give a second coat.

The ferrules of a rod often loosen up, owing to a slight shrinking of the material. Refasten them with ferrule cement, a hard, wax-like substance which softens with heat and then holds like glue. If the joints stick or go together hard, rub down just a trifle with powdered pumice. A drop of light oil will often do wonders with an obstinate ferrule.

A steel rod requires less care than one of wood or split bamboo, the main requisite being to see that it does not rust. Occasional doses of light oil, such as "3-in-1," inside the joints will take care of this. A friend of mine always winds his steel rods with silk thread the entire length, and then gives two coats of varnish. It takes some time, but when the job is finished that rod is absolutely rust-proof.

Proper care of a good line requires first of all that it be dried after fishing, since the best line in the world will go bad quickly if it is put away wet. The enameled line should not be left on the reel at the end of the season, but transferred to a spool of large diameter, not wound on a cardboard, for in that case the line bends at too sharp an angle.

As for your reel, see to it that all screws are kept tight and that it gets plenty of oil. This is especially necessary if it is a bait casting reel, for the friction to which the bearings are subjected will quickly grind them out if they run dry, and that means that the reel must be sent back to the factory to be reset. If the tiny screw caps that protect the bearings are kept packed with vaseline you will have no trouble. Light oil will do the work, but must be applied more frequently. Once a season take the reel apart, clean it thoroughly with gasoline, apply fresh oil, and then reassemble.

When the fishing season is over put all trout and bass flies, feathered spoons, and bucktail baits in an air-tight fruit jar with two or three moth balls. Otherwise tackle of this sort is practically sure to go toward fattening up the moth tribe before the next angling season opens. That may be all right from the moths' viewpoint, but is hardly good economy for the angler.

Now for a few practical fishing suggestions. The majority of anglers are born, not made, and the person with the angling instinct will get more actual benefit out of a day or two on stream or lake in company with an experienced fisherman than from much reading on the subject. None the less, printed instructions surely have their place and value.

It is my hope that the reader lives in a region where brook trout occur, since fly casting for speckled trout provides the most splendid sport that mortal man can enjoy. In the early season, however, when the water is high and cold, trout will not rise freely to flies, and you must then pursue them with bait. Their natural food includes worms, small minnows, grasshoppers, crickets, bugs and insects of all sorts, small toads and frogs, crawfish, lizards, and insect larvæ. For actual fishing, the first four are sufficient.

Angleworms are very effective on all occasions in the early spring, but are not much good in hot weather, or when the water is low, except on cloudy, rainy days, or before daybreak. Grasshoppers and crickets are always good whenever they can be obtained, the former being more satisfactory only because they are tougher in construction and hence stay on the hook better. An empty tobacco tin with some holes punched in it makes a fine receptacle for insect baits. The sooner they are used after capture, the better they will be. A small minnow is a boss bait for large trout, and is best hooked so that it will spin in the current. Pass the hook in at the mouth, out at the gill opening, and then through the body just back of the dorsal fin. This gives it a sort of corkscrew twist, and it spins most gloriously. To prevent your line from kinking up into a horrible tangle, use a snelled hook with a swivel attached.

Black bass include two varieties, the large and the small mouth. The latter are considered superior in game qualities, and occur in swift rivers or cold, rocky lakes, whereas the large-mouth bass are generally found in slow streams or marshy lakes. The baits and mode of fishing for the two are about the same. Bass are caught by fly casting, bait casting, fishing with live bait, and trolling. The favorite live baits are minnows, frogs, grasshoppers, and crickets, small bullheads, newts, crawfish, and hellgramites (known locally as dobsons or bloomers).

For small-mouth bass, use minnows three or four inches long (perhaps a trifle larger for big-mouth), and fish with a float, unless the water is deep. Small-mouth usually lurk around rocky places, while the big-mouth prefer weedy locations. When you get a bite, give the bass at least ten seconds before striking. At first he merely holds the minnow between his lips, then turns it around to get it in a good position for swallowing; if you strike too soon you will be sure to rip the bait from his mouth.

Hellgramites, a universal favorite with all anglers for small-mouth, are interesting creatures built on the general lines of a thousand-legged worm with a pair of pliers instead of a nose. They are the larvæ of the common dragon-fly, and live under stones in running water. The hellgramite has a tough collar just back of his head, and the point of the hook should be slipped under this. I doubt if the operation hurts the hellgramite to any extent, but it surely makes him exceedingly mad; so handle him carefully, or his pliers will give you a good nip.

Perch and pickerel are usually caught either by fishing with live bait or trolling, though bait casting is highly effective for pickerel, and certainly affords far more sport than trolling, which to me appeals as the lowest form of angling. The best bait is live minnows, small ones for perch and larger for pickerel. You should generally use a float to keep your minnow off the bottom where he will be quickly tangled in the weeds, and observe the same rule about striking as in bass fishing. Small shiners, that is those about two inches long, are generally hooked through the lips, larger ones back of the dorsal fin, the hook passing completely through the body, care being taken not to injure the backbone, since that means that the minnow will die quickly. The point of the hook should be exposed, ready for business as soon as you strike.

The best way to learn the art of successful fishing is to keep everlastingly at it. Profit by experience, but don't expect to find your fish in the same place every day, and don't figure that the same bait or mode of angling must be effective one day because it was another. Never feel discouraged because of an unsuccessful trip, for there are times when old daddy Izaak Walton himself couldn't make the fish bite, to save his life. Cultivate patience, but it isn't patience when an angler sits in the same place for hours without getting a bite: that is mere stupidity.

In conclusion, I should like to add a few words on the subject of sportsmanship. Every angler ought to be a true sportsman. Now just what does that term include? First of all, the true sportsman is careful to observe the game laws. He does not fish out of season, nor does he keep fish under the legal size. Small fish he returns to the water as quickly as possible, and he is very careful to do them no unnecessary injury in removing from the hook. He handles baby trout with especial care. They must not be touched with dry hands, for in that case the slime will be rubbed from the speckled sides, and a dead trout will be the result.

The true sportsman will not make a fish hog of himself merely because circumstances make it possible for him to score a big killing. Some States have a limit for the catch that is far too generous, or else have no limit at all, and we can thank the fish hogs for the unfortunate fact that our fishing is now so much poorer than it used to be. The man who kills a hundred—or even fifty—small trout in a day ought to be deprived forever of the fun of angling. If a person must go out for a record, let him return his fish to the water as fast as caught; in that way he will get as much fun out of it, and the fish suffer no permanent harm.

The true sportsman is considerate of the rights of others. He doesn't destroy fences, nor tramp through growing crops on his way to the fishing grounds. If he opens a gate, he is careful to close it immediately. He never sets the woods on fire should he take occasion to cook a meal in the open. He doesn't grouch when the luck is poor, nor blame any mishaps of the trip on his fishing partner. In short, he takes everything as it comes, good and bad alike, as all a part of the game, and only the true sportsman can appreciate to the fullest extent the glorious opportunities for healthful recreation afforded by a day on lake or stream.

Note.—For further reading on the subject of fishing, see the following books: "The Book of the Black Bass," and "Bass, Pike, Perch, and other Game Fishes of America," both by James A. Henshall, M. D.; "Casting Tackle and Methods," by O. W. Smith; "Streamcraft," by George Parker Holden, M. D.; "Goin' Fishin'," by Dixie Carroll; "Lake and Stream Game Fishing," by Dixie Carroll.

THINGS TO KNOW ABOUT REPTILES

By G. KINGSLEY NOBLE, Ph.D.

FOREWORD

ONLY from fossil skeletons buried in the earth's surface can be gleaned the long history of the class Reptilia. At least twenty million years ago—many ages before the existence of man—there was a time when most animals were fish-like and lived in the ocean. A few primitive amphibians had just begun to spread out into the fresh-water streams and ponds, and even to seek dwelling places on the land itself. One of the mightiest of these amphibians was a massive armored creature somewhat resembling a salamander. And it was this creature which probably gave rise to the more typically land-dwelling, air-breathing reptiles. These early reptiles thrived and grew to be a mighty race, ruling the world—earth, sky, and sea. Gigantic Dinosaurs or Terrible Lizards, whose bodies extended seventy or eighty feet and whose heads towered twenty or thirty feet in the air, thundered over the fields and browsed along the marshes. Ichthyosaurs or Fish-Lizards flashed about in the water preying upon the fish. And long before the earth had seen the feathered birds, Pterodactyls or Wing-fingered Lizards—some with a wing stretch of twenty feet--swept like giant bats through the air. It was an age of Reptiles indeed, but like other great dominions it had its fall. Whether this was due to the cooling of the earth or the rise of some great plague we do not know, but all save the fittest of that cold-blooded race perished from the earth.

To-day only a few stragglers remain of those which existed during that long regime. While there have actually been found skeletons of about twenty-one prehistoric orders, to-day all our living reptiles are classed into four orders.

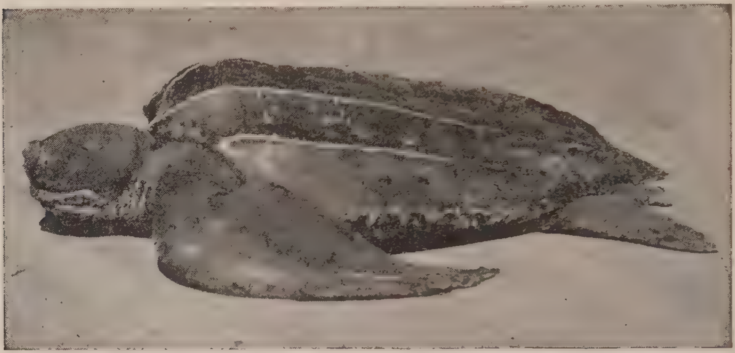
Instead of mastering the earth, sky, and sea, they are all typically terrestrial: even the marine turtles always return to the land to breed. The word "reptile" comes from the Latin verb "*repo*," meaning "to crawl." It is this characteristic which applies to virtually all of our modern reptiles. Reptiles are placed between amphibians and birds in the zoölogical scale. Like the amphibians, they are cold-blooded. That is, the temperature of their blood remains practically the same as that of the surrounding environment. For this reason, they do not require as much food as we do, and can often go long periods with nothing to eat whatever. Reptiles differ radically from fishes and amphibians, but agree with birds in possessing eggs which are covered with a calcareous or leathery shell. The eggs are richly supplied with yolk, and the embryo is surrounded with membranes which protect it from injury and allow it to take in oxygen through the shell. The protecting membrane is called an amnion, the respiratory the allantois. Amnion and allantois are characteristic of all reptiles, birds, and mammals. They do not occur in the lower forms such as the fishes and amphibians. The young reptile hatches from the egg in the same form as the parent, without going through the tadpole or larval stage of the amphibians. Reptiles are provided with scales or large horny plates which enable them to live in extremely arid regions where the softer skinned amphibians would dry up. Modern reptiles are divided into four orders: Testudinata, Rhynchocephalia, Loricata, and Squamata. The Rhynchocephalia includes only the lizard-like *Sphenodon* of New Zealand. The other three orders are well represented in the United States. We will consider them under the headings "Turtles," "Crocodiles and Alligators," "Lizards," and "Snakes in General."

TURTLES

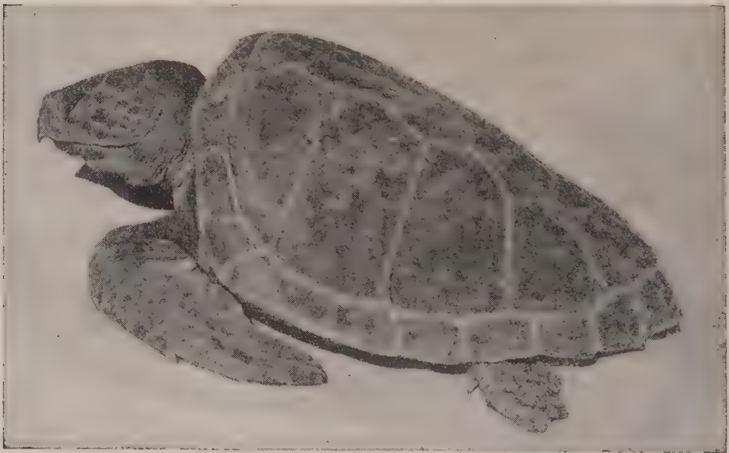
TURTLES, whether terrestrial or aquatic, are grouped together in the order Testudinata. They are sometimes called Chelonia, a name derived from the Greek word for a shield. The shield or shell is of course the chief characteristic of the order. It consists of two parts, the upper shell or carapace, and the lower or plastron. These two parts vary greatly in both form and extent in the various species of turtles. The head, limbs, and tail are covered with a scaly integument and can be drawn wholly or partly within the shell, according to the species. The shell itself is made up of bony plates fitted together and covered by horny shields. The two main groups of American Chelonians which we shall consider here are the Tortoises and the Terrapins. The former are adapted to terrestrial life and the latter to aquatic.

Turtles are probably the most primitive of existing reptiles. They have been derived from the Cotylosaurs of Permian time and are not at all related to modern lizards or crocodiles. In some way Turtles have managed to get inside their own ribs, for the shell is formed in part from ribs and these ribs are outside the shoulder and pelvic girdles, a condition not found in any other group of vertebrates or back-boned animals. All Turtles lay eggs which they bury in shallow pits along sandy beaches, grassy banks of streams, or sunny hillsides. The eggs are similar to those of snakes, but the shells are inclined to be brittle rather than leathery.

The SEA TURTLES are especially adapted for life in the ocean, their limbs taking forms of powerful paddles or flippers. They are widely distributed in the tropical and semi-tropical seas, and occasionally wander to more northern coasts. They are commonly found off the coast of Florida, where they land only to deposit their eggs in the sand above the high-water mark and leave them for the sun to hatch. The young are obliged to care for themselves, and many fall prey to sea birds and large fish before they ever reach the deep ocean. In the LEATHER-BACK TURTLE the horny shields are entirely absent, and the bony plates are represented by a mosaic of irregular bones having no attachment to the ribs as in the case of all other Turtles. The bony mosaic is covered with a smooth, leathery integument, lengthwise of which run seven heavy ridges. These creatures are the largest of our Turtles, sometimes attaining a length of eight feet and a weight of one thousand pounds. The LOGGERHEAD and the GREEN TURTLE are easily confused because of their similar dark-brown shells covered with smooth shields. However, the head of the Loggerhead is larger than that of the Green Turtle, and the front flippers of the former possess two claws while those of the latter possess



LEATHER-BACK TURTLE
The largest of our turtles
FROM A PHOTOGRAPH BY HERBERT LANG OF THE AMERICAN MUSEUM OF NATURAL HISTORY



LOGGERHEAD TURTLE
FROM A PHOTOGRAPH BY HERBERT LANG OF THE AMERICAN MUSEUM OF NATURAL HISTORY

but one. The Green Turtle, which takes its name from the greenish hue of the fat, is edible and of great market value. The HAWKBILL, the smallest of the Sea Turtles, is of still greater commercial value because of its production of "tortoise-shell." It is distinguished from the other Sea Turtles by its pronounced beak and by the horny plates of the shell which overlap like fish scales.

GREEN TURTLE

From a photograph by Herbert Lang of the American Museum of Natural History

COMMON SNAPPING TURTLE

From a photograph by Herbert Lang of the American Museum of Natural History

SNAPPING TURTLES frequent brackish or fresh water. They are unique in the huge and sinister head, the massive hooked jaws, the large tail crested along the upper edge like that of a crocodile, and the relatively small size of their shell. Although they are unable to protect themselves by drawing in their heads and limbs, they are powerful and aggressive fighters, and defend themselves somewhat as the snake by striking at the object of their wrath. They feed under water chiefly on fish, frogs, and ducks. The two best-known representatives of this group in the United States are the Common Snapping Turtle (*Chelydra serpentina*) of the East, and the Alligator Snapper (*Macrochelys temminckii*) of the South. Although the Alligator Snapper is much the larger, both are very similar in habits. Still, the Alligator Snapper is provided with a flexible appendage just inside its lower jaw which enables it to angle for its prey. Lying motionless with its mouth wide open, the Turtle can wave this back and forth until the unsuspecting fish, attracted by what he supposes to be a worm, is within easy reach of the waiting jaws.

DIAMOND-BACK TERRAPIN

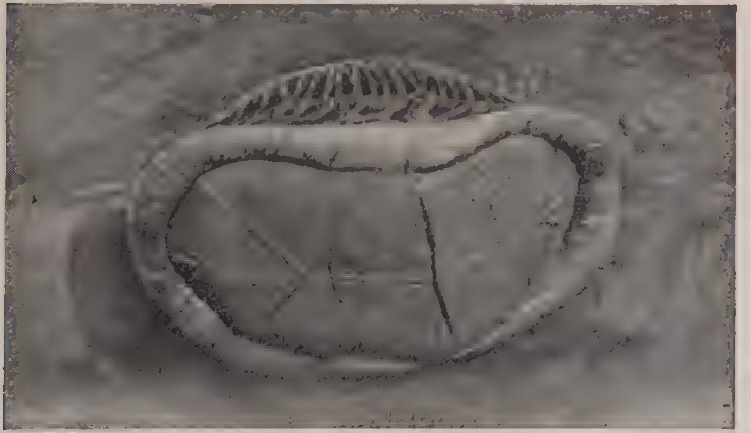
From a photograph by Herbert Lang of the American Museum of Natural History

The Mud Turtles, which frequent slow streams and muddy rivers, form a group difficult to classify, as they are all more or less variable and yet different from each other. They are a nuisance to fishermen because they take a hook greedily and behave like a good-sized fish. Some when disturbed exude a musky odor. They possess a means of closing their shells similar to that of the Box Turtles. In some ways they resemble miniature Snapping Turtles.

PAINTED TURTLE

From a photograph by Herbert Lang of the American Museum of Natural History

The Terrapins form a group known as the Pond and River Turtles. They depend on water to such an extent that it is said that some can only eat their food (insects, tadpoles, and fishes) beneath the surface. The name "Terrapin" is most often used commercially to signify the



COMMON BOX TURTLE WITH PLASTRON CLOSED

From a photograph by Herbert Lang of the American Museum of Natural History

hard-shelled, edible fresh-water Turtles handled for market purposes. They are generally distributed over the United States and are characterized by their broad, smooth shells and their extensively webbed feet. The DIAMOND-BACK TERRAPIN is the best known and most valuable of the edible Terrapins. It prefers the salt marshes or brackish estuaries, and is still found abundantly along certain parts of the Atlantic coast. They are secured in the winter by probing into the burrows along the banks where they have crawled to hibernate.

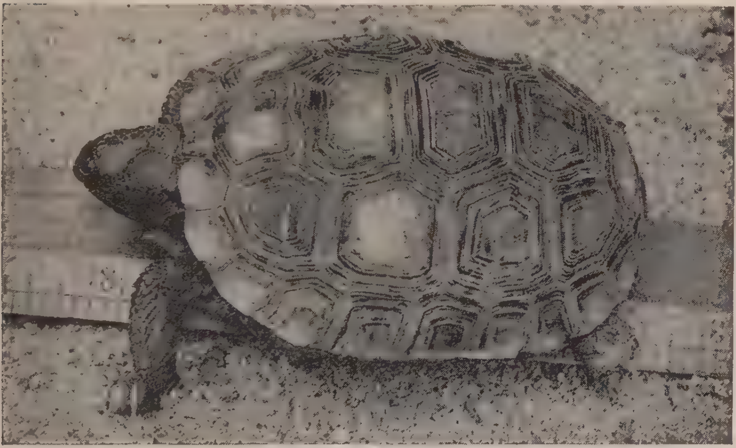
The most familiar of our fresh-water Terrapins in eastern United States are the PAINTED and the SPOTTED TURTLES. The former species is readily recognized by the pink border of its shell, the latter by the yellow spots on its dark carapace.

COMMON BOX TURTLE
FROM A PHOTOGRAPH BY HERBERT LANG OF THE AMERICAN MUSEUM OF NATURAL HISTORY

BOX TURTLES form a connecting link between the aquatic Turtles and the terrestrial Tortoises. They remind us of people in that they are primarily terrestrial but seek the water during the hot summer months. Their chief characteristic lies in the structure of the shell. A hinge across the center of the plastron, freely movable in relation to the carapace, enables the Box Turtle to completely close the front and rear shell openings left after the head and limbs have been drawn in. The SEMI-BOX TURTLES belong to a very different group. The rear portion of their plastron is only slightly movable. They are aquatic Turtles and possess fully webbed feet. Although most agile in water, they are fond of wandering on land. The true Box Turtles have club-shaped feet and do not seem at home in the water. Inoffensive creatures, they wander through the woods in spring and fall in search of berries and fungi on which they feed. They hibernate in winter in shallow leaf-blown hollows of the woods.

The TORTOISES form a group of terrestrial Turtles, uncommon in the New World. Of the three species in our country, the GOPHER TORTOISE is the most common and is found in the Southeast. The other two occur in the deserts of Arizona, Texas, and California. Their upper and lower shells are completely united in a solid box-like covering, the carapace being high and dome-like. They frequent dry, barren places and dig burrows in which they take shelter during the day, emerging in the early evening to search for food such as fruit and vegetation. Gopher Turtles seem to be very clumsy creatures, but they are nevertheless rather intelligent. In captivity, they are easily tamed and may even experience a Turtle affection. The male Gopher, unlike the majority of the Turtles, utters a rasping call, repeated at short intervals, during the breeding season in May and June.

Courtesy of American Museum of Natural History



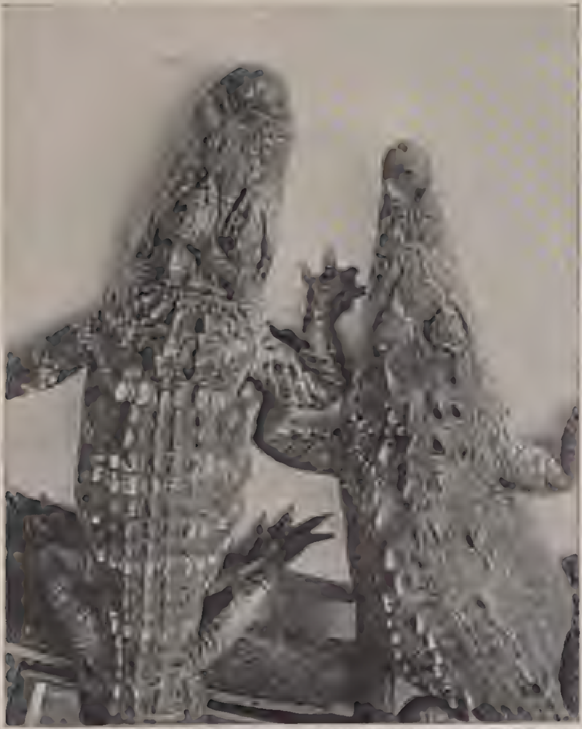
YOUNG GOPHER TORTOISE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

SOFT-SHELLED TURTLES are found in abundance in the ponds and muddy streams of the South and the Mississippi Valley. Their shells are soft and leathery, with flabby borders. They have very powerful jaws, and bite and snap with such energy and rapidity that they are well named "Soft-shelled Snapping Turtles." Large quantities of them are sold as food. Out of water they look so much like flap-jacks that Flapjack Turtle has become their commercial name. At the end of a very long neck is a narrow head, the snout being provided with a slender proboscis. Like the Snapping Turtle, they lay large spherical eggs, which the female deposits in a hollow scooped generally in a sand bank some distance from the water's edge.

CROCODILES AND ALLIGATORS

THE Alligator, the Caiman, the Crocodile and other less-known forms are grouped together in a separate order of reptiles, Loricata. These reptiles are all large, and although they appear very much like giant lizards, they are nevertheless much more closely related to the dinosaurs and the aberrant *Sphenodon* of New Zealand than to any true lizards.

Courtesy of American Museum of Natural History



AMERICAN ALLIGATOR (LEFT) AND AMERICAN CROCODILE (RIGHT)
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

The name Alligator is a corruption of the Spanish "El Lagarto"—the lizard—a name used by the early Spanish settlers. But skull structure, arterial system, and many other structural features show that the Alligator is about as closely related to the birds as to the lizards.

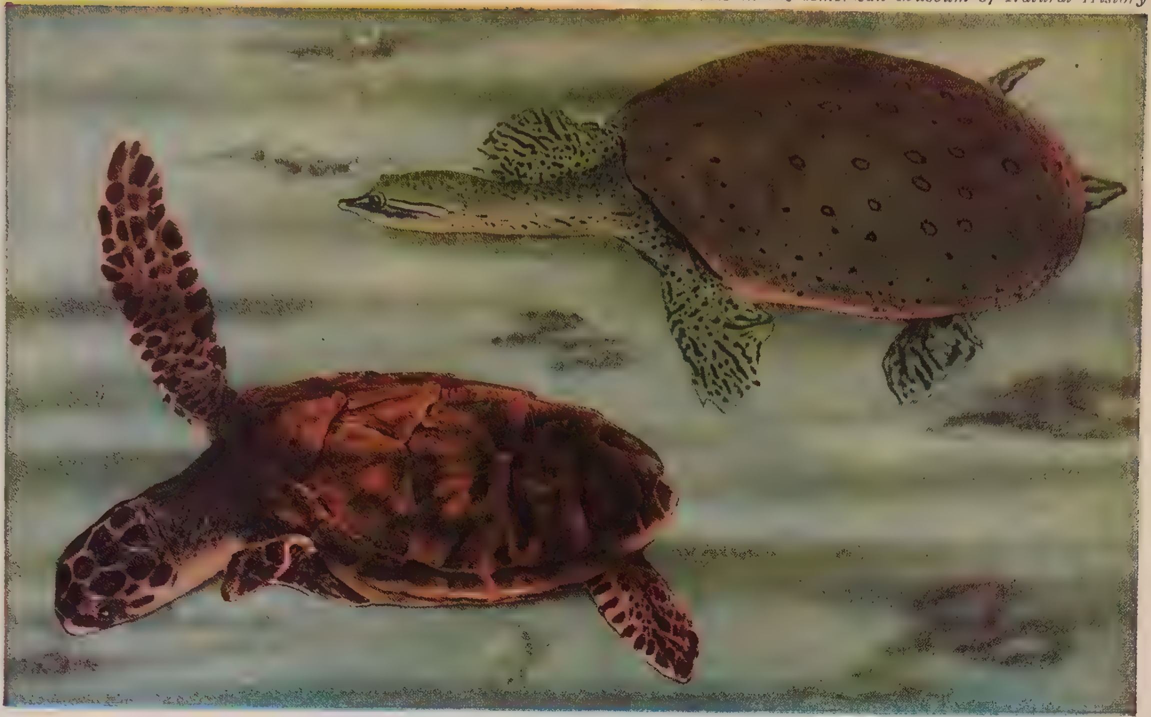
The broad, flat head readily distinguishes the ALLIGATOR from its relative the CROCODILE. In the United States, only these two types of Loricata occur, but in other countries, especially those lying within the tropics, there are found other related forms.

Courtesy of Doubleday, Page & Co.

AMERICAN ALLIGATOR
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

The Alligator and its relatives frequent swamps and slow-moving streams. Our Alligator is perhaps most abundant in Florida, where it abounds in the lagoons and waterways. There it excavates caverns in the muddy banks of the streams, and on the approach of winter retreats into them to hibernate until spring.

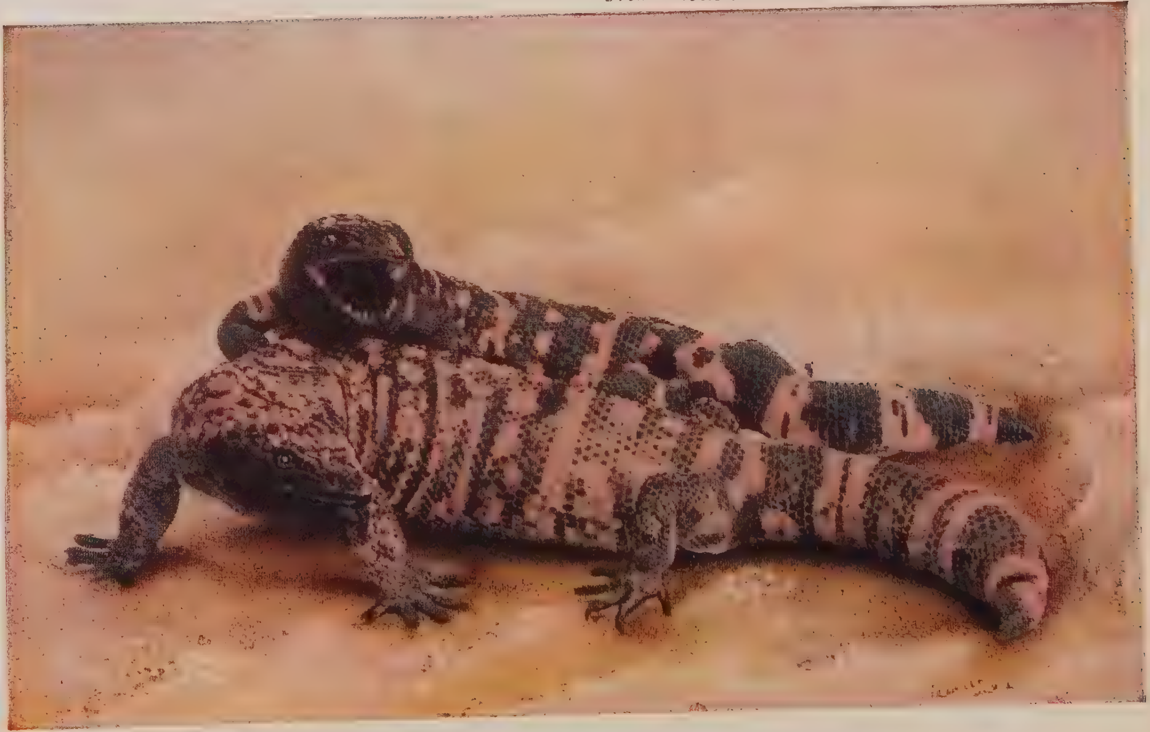
The mating season occurs in spring. It is then that the males bellow



From Models in the American Museum of Natural History

HAWK-BILL TURTLE

SOFT-SHELLED TURTLE



From Models in the American Museum of Natural History

GILA MONSTERS

loudly for mates. Scent glands which pour forth secretions into the water apparently aid in recognition. A conspicuous pair of these glands is located on the ventral surface of the throat in both sexes.

Egg-laying does not occur until the maternal parent has constructed a nest—a huge pile of mud, sticks, and grass. In this pile, the eggs, about fifty in number, are laid and carefully covered over. The warmth of the sun, together with the heat generated by the decaying matter, incubates the eggs.

Development is not so dependent on warmth as in the case of the hen's egg, since the embryo is already well advanced at the time the egg is laid. The development of the Alligator's egg is slow. It requires eight weeks for the eggs to hatch. No remarkable parental care is exhibited by our Alligator as in the case of the Madagascar Crocodile. The female of the latter species is known to dig out the eggs just before they hatch, and apparently to assist the young Crocodiles in escaping from their leathery shells. The newly hatched Alligator young measures about eight inches. The adult seldom exceeds fourteen feet. Most of the large Alligators have been exterminated for their skins.

Courtesy of Doubleday, Page & Co.

AMERICAN CROCODILE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

The Crocodile may be distinguished from its relative the Alligator not only by its narrower head but also by its more pointed snout and by a pair of prominent teeth on the lower jaw which fit into a notch in the edge of the upper jaw. It has much the same habits as the Alligator, but is more fond of the salt water. Unlike the Alligator, it selects dry regions to lay its eggs, and exhibits considerable care in guarding the nest and helping the young to escape from the eggs at the time of hatching.

The Crocodile is found in the United States only at the extreme end of Florida, but the species, *Crocodylus acutus*, occurs also in the Greater Antilles and both coasts of Central America from Mexico to Ecuador and Colombia. There are many species of Crocodiles found in other parts of the world. The group has a wide distribution throughout the tropics of the globe.

Our Crocodile is becoming very rare in Florida. Still a few small specimens frequent shallow lagoons and arms of the sea where they can be seen sunning themselves during the day. At night they hunt for fish, or more rarely for birds and small mammals.

LIZARDS

THE name Lizard means to most of us a four-legged, long-tailed, cold-blooded vertebrate. But salamanders, too, have these qualifications, and it is with salamanders that Lizards are mostly confused. The Lizard is distinguished from the salamander by its rough, scaly skin, which is dry and not moist to the touch as that of the salamander. Lizards are reptiles and have the characters of that class, while salamanders are amphibians.

Not all Lizards have four legs. A number are legless and appear very much like snakes. Unlike snakes, they possess eyelids and an outer ear opening. The two halves of the lower jaw are united firmly together and not loosely connected by an expansible ligament as in the case of the snakes. Lizards differ further from snakes in their less compact skull, the brain case particularly being more cartilaginous. These legless Lizards are burrowers. The absence of legs seems to be a distinct advantage to them in gliding through their subterranean retreats.

Many Lizards are admirably adapted to the particular environment in which they live. This is well illustrated in southwestern United States. Here most of the desert dwellers appear faded out. Their subdued tones of pale yellows and grays harmonize well with the sand and afford them not only concealment from their enemies but also a protection against the sun's rays. Their possession of this "concealing coloration" is perhaps not surprising, for the struggle for life in the desert is fearfully severe. Comparatively few creatures besides the Lizards have succeeded in adapting themselves to such a life.

The majority of the desert Lizards are great burrowers, either diving into the sand to seek protection from their enemies or wriggling into it at night to escape the chill air. It is among these desert Lizards that we find the nostrils protected by neat valves which can be closed at will; the eyes, covered by eyelids, have a transparent disk in the center, the ear opening shielded by a fringe of scales, or entirely reduced.

In southwestern United States, the desert Lizards are not all burrowers. Although belonging chiefly to a single family, *Iguanidæ*, they have specialized along two different lines. The "horned toad" and its allies are flat and squatty, with short limbs and tail. They spend much of their time buried in the sand, and only venture forth in the heat of the day to stalk insects. The other group, *Crotaphytus*, *Callisaurus*, *Uma*, etc., are adapted to swift running across the desert. Some of these, such as *Callisaurus crinitus* and *Uma notata*, have developed fringes on the digits which prevent their feet from sinking into the loose sand as they rush madly along. In running the front limbs are held close to the sides of the body and the Lizard runs only on its hind legs. The long

Courtesy of Doubleday, Page & Co.

BANDED GECKO
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

tail acts as a balancer, enabling the Lizard to lean well forward. It is not obvious at first that the creature is using only its hind limbs.

Many Lizards are arboreal, with long bodies and a long, occasionally prehensile tail. Many others are semi-arboreal, others fossorial or burrowing, but none of the Lizards of the United States are aquatic. To-day about one hundred and thirty-five species of Lizards are known to occur in the United States. Only a few of the more interesting forms may be mentioned here.

The GECKOS (*Gekkonidæ*) embraces a family of mostly arboreal Lizards having adhesive disks on the digits and eyes without eyelids. Our two genera, *Phyllodactylus* on the extreme southwest coast, and *Sphaerodactylus* on the extreme southeast coast region, are as much terrestrial as they are arboreal. They are both nocturnal, and are only to be found in the daytime by turning over stones and by searching under logs where they have secreted themselves.

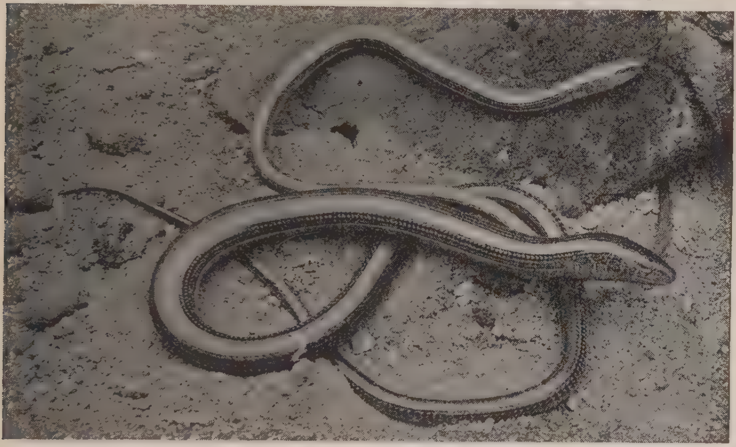
ADULT BLUE-TAILED SKINK AND YOUNG

FROM A PHOTOGRAPH BY HERBERT LANG OF THE AMERICAN MUSEUM OF NATURAL HISTORY

The Banded Gecko (*Coleonyx*) is generally placed in a separate family from the Gekkonidæ. This, the *Eublepharidæ*, comprises a group of unrelated genera widely distributed around the world. The Banded Gecko, like many of the gekkonids, has a shrill voice and delicate skin, but unlike most gekkonids, it spends a large part of its life æstivating far below the surface of the deserts which it inhabits.

The Gila Monster (*Heloderma suspectum*) is found from southern Utah and Nevada south to Arizona and Sonora. In spite of its name, it is a particularly sluggish animal. Nevertheless, it has the distinction of being, with its relative the Beaded Lizard (*H. horridum*) of Mexico, the only poisonous Lizard in the world. Its bizarre coloration of pink and black stamp it at once as something unusual. Many other Lizards besides the Gila Monster are feared as poisonous, but none of these are in the slightest degree harmful. The bite of the Gila Monster is painful, but probably not dangerous to man. At least there is no death on record which cannot be attributed to other causes than the bite of this Lizard.

Courtesy of Doubleday, Page, & Co.



GLASS SNAKE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

Structurally the Beaded Lizards and the Geckos are primitive Lizards. The AXNTUSIDS also are in many ways unspecialized. There are only three species of this family in the United States. Two of these species are nocturnal and rarely seen. They are secretive creatures, hiding under the bark of trees, loose stones, or debris.

The *Scincidæ* embrace a great many ancient types widely distributed throughout the world. They are all secretive creatures, and rarely seen except when the logs under which they hide are disturbed. The BLUE-TAILED SKINK (*Plestiodon fasciatus*) is our commonest eastern form. The young is slaty black or dark brown, with five pale stripes the length of its back, and with a bright blue tail. As the creature matures, it develops a pinkish tone on the head. Old males are not much larger than the females but have a much redder head, and often lose the body stripes entirely. The adults in the South are commonly called Red-headed "Scorpions."

Three genera of legless Lizards occur in the United States. These have been placed in three families. The best known of these Lizards is the Glass "Snake" (*Ophisaurus ventralis*), which is not infrequently met in certain parts of the South. The Blind "Worm" (*Anniella*) is closely related to the Glass "Snake," but it is very different in appearance. It is very pale, almost worm-like in form, and is also called "Worm Snake," and Worm Lizard. It is confined to certain sandy regions of California. The third of these legless Lizards is restricted to Florida, as its name, Florida Worm Lizard (*Rhineura floridana*), might indicate.

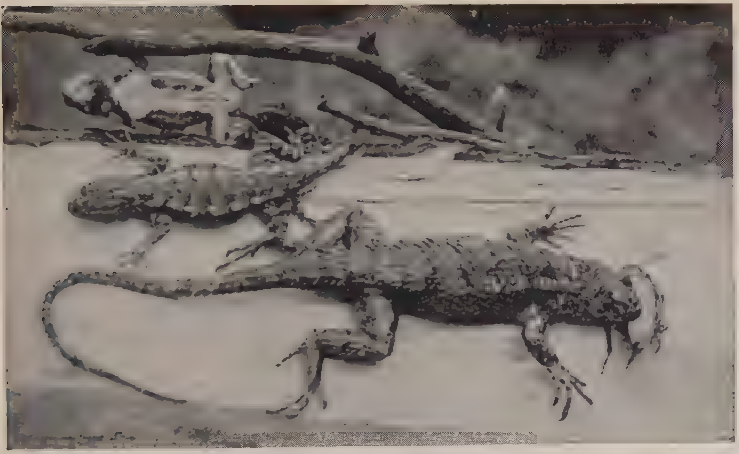
Courtesy of the American Museum of Natural History

AMERICAN, or FLORIDA, CHAMELEON
From a photograph by Raymond L. Ditmars

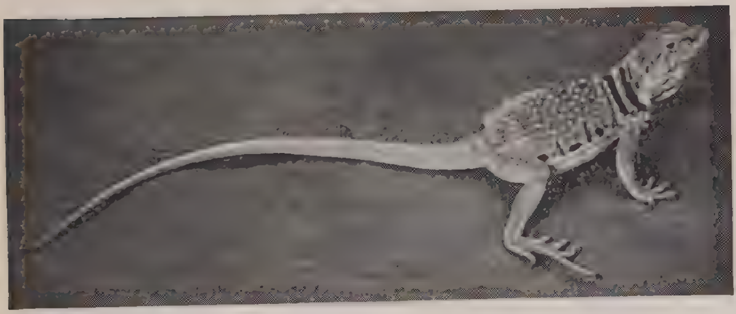
This species is related to the *Amphisbnæas*—"two-headed Lizards" of South America. They receive the name from the fact that both ends of their body look alike, and they are able to progress equally well in either direction. Practically all legless Lizards are burrowers, and some, like the Florida Worm Lizard, rarely come to the surface.

The two great families of Lizards in the United States are the Iguanids and the Teiids. Most of the species commonly met with are referable to these groups. There are ten genera of Iguanids and two of Teiids within this region. Our common Fence Lizard (*Sceloporus*) and the Swift (*Cnemidophorus*) are perhaps our most familiar examples. In general the Iguanids are short snouted and the Teiids long snouted. Both families are either oviparous or ovoviviparous—laying eggs or giving birth to their young alive. The Teiids of North America have not undergone the remarkable radiation we find in the former family. Among the Iguanids are found arboreal forms, American "Chameleons"

Courtesy of Doubleday, Page & Co.



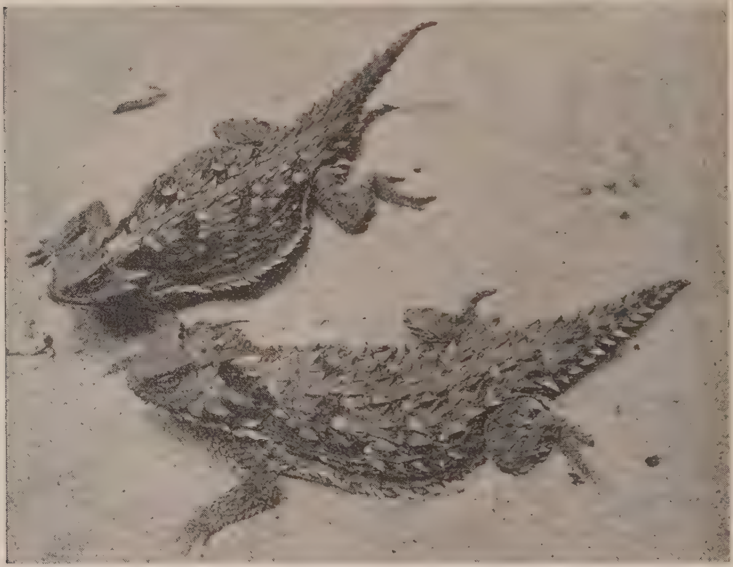
COMMON SWIFT OR FENCE LIZARD
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS



COLLARED LIZARD
FROM A PHOTOGRAPH BY JULIUS KIRSCHNER OF THE AMERICAN MUSEUM OF NATURAL HISTORY

(*Anolis*); semi-arboreal forms, Desert Iguanas (*Dipsosaurus*), Cape Iguanas (*Ctenosaura*), Swifts (*Sceloporus*); terrestrial swift-running types, Collared Lizard (*Crotaphytus*), Zebra-tailed Lizard (*Callisaurus*), Desert Lizard (*Uma*), etc., and terrestrial slow-moving species, Horned Lizards or Horned "Toads" (*Phrynosoma*). In brief, the Lizards offer us some of the best examples of adaptation found among the vertebrate animals.

Courtesy of Doubleday, Page & Co.

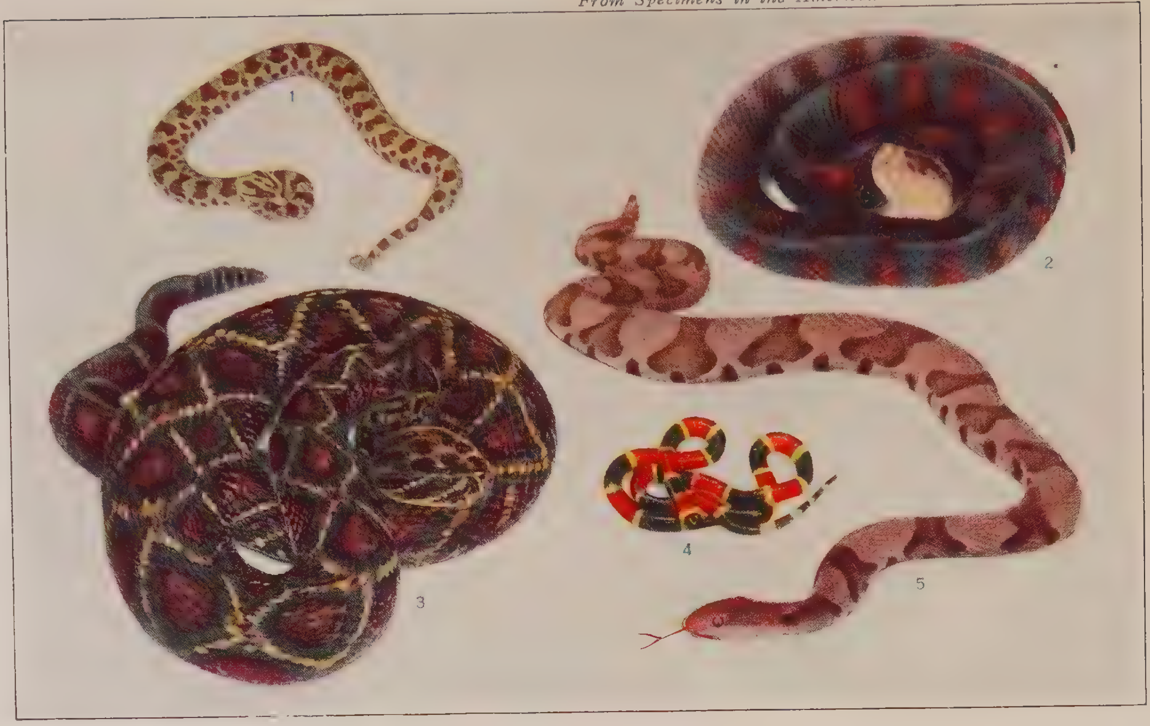


CALIFORNIA (OR PACIFIC) HORNED LIZARD
From a photograph by Raymond L. Ditmars

SNAKES IN GENERAL

MAN seems to have inherited, or perhaps acquired, a great curiosity and fascination in Snakes. Throughout history, this fascination has made man ready to invent many strange stories concerning Snakes, and to enlarge infinitely upon the tales already told. Snakes have been the objects of many superstitions, and have figured prominently in many religions of the world. In the Bible, we have the Serpent in the Garden

From Specimens in the American Museum of Natural History

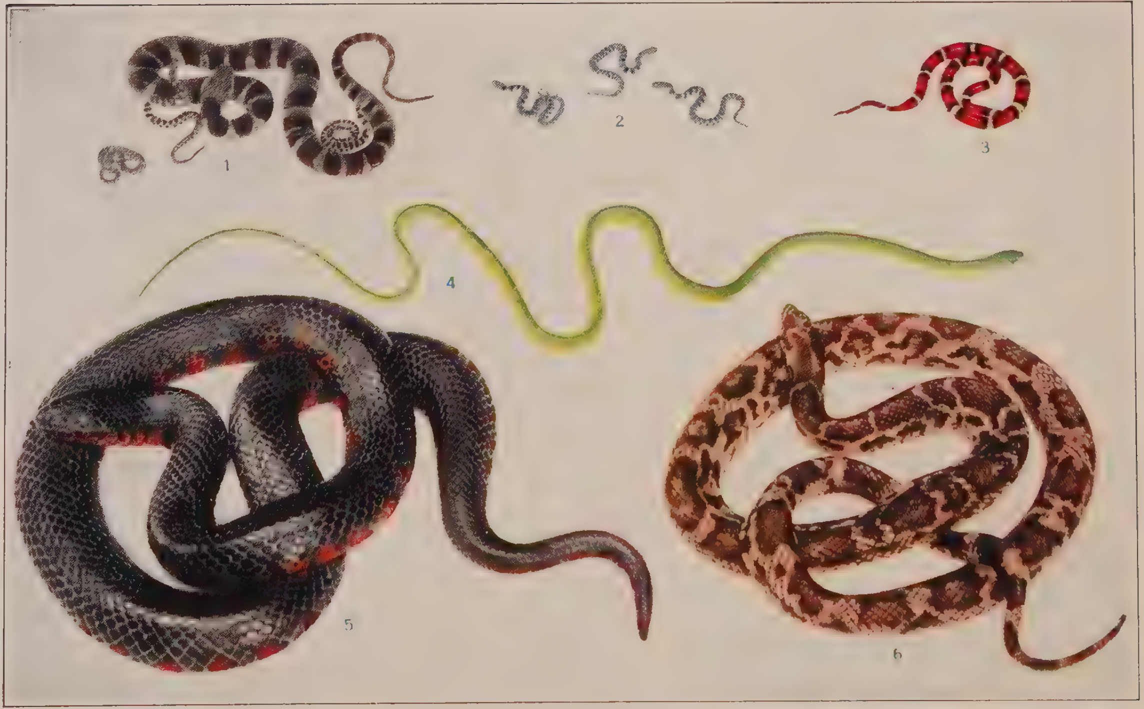


TYPES OF POISONOUS SNAKES

1—Western Pygmy Rattler
4—Coral Snake

2—Moccasin

3—Diamond-back Rattler
5 Copperhead



From Specimens in the American Museum of Natural History

TYPES OF HARMLESS SNAKES

1-2—Water Snake and Young
3—Scarlet Milk Snake
4—Green Snake
5—Mud Snake
6—Pine Snake

of Eden. In Greek mythology there is the story of the Laocoon and the serpent-headed Medusa. Cleopatra, when she tired of life, allowed an asp to bite her. To-day it is such gross sacrilege in the Hindu religion to kill a cobra that they are left to wander about homes and villages, and thus cause the death of many thousands of natives annually. In the southwestern part of our own country the Hopi Indians still observe their nine-day Snake-dance ceremony. Medieval sailors feared to venture far from shore because of the gigantic sea serpents which their imaginations had created. To-day many people live in fear of a fantastical "Hoop Snake" which holds its tail in its mouth and rolls along like a hoop in pursuit of its prey. Other people believe that because a Milk Snake frequents stables it robs the cows of their milk. Again it is claimed that Snakes hypnotize their prey. No direct observation of this has ever been recorded, and the misconception is probably due to the peculiarly glassy stare of the Snake's eyes. While most lizards have movable eyelids, the eyes of a Snake are covered completely with a thin horny membrane which is periodically shed with the skin. Naturally these eyelidless eyes must stare, but they do not hypnotize.

Snakes are by far the most widely and commonly distributed of the reptiles. Although they are particularly abundant in the tropics, many species range as far north as Canada and Iceland. They may be found in deep forests, in arid deserts, in ponds and marshes, and in grassy plains. Some spend most of their lives underground, while others are confined to tropical seas. Their bodies are not always of a uniform shape. Arboreal Snakes have in general very long bodies, aquatic species compressed ones, while terrestrial species vary greatly in body form. The scales along the ventral side of the body are unusually broad, and as they are waved backward by the muscles, they push the body forward, as the treads push an army tank. In the size and habits of these reptiles there is also an infinite variety. The PYTHONS of southern Asia may weigh over three hundred pounds and measure nearly thirty feet in length, while some of the burrowing snakes are as thin as the proverbial toothpick, and not more than five inches in length. Snakes may be ovoviviparous or oviparous. That is, the young of some species come from the mother's body alive and able to shift for themselves, while others lay eggs from which the young hatch out later on. The eggs are similar to those of a small hen, but the shells are soft and leathery rather than brittle. They are deposited in the earth or in brush piles, and are usually deserted by the mother and left to be hatched by the heat of the sun, or the warmth of vegetable decomposition.

Less than twenty of the one hundred and forty-six species found in the United States are poisonous, and these are readily distinguishable. Many a boy has thrown out his chest and exclaimed, "I killed a Snake!" More than likely it was a harmless, defenseless creature, which, like the nursery cat, "never did any harm but kill the mice in Grandpa's barn," or—of more importance—killed the mice in his grain fields. One should never be blind to the fact that some serpents are dangerous, but it is an injustice to disregard their cleanliness, their beauty, and their economic value. The uncanny flickering motion of the forked tongue often leads to the belief that it is the fang of a venomous Snake. On the contrary, it is but the organ with which the Snake feels its way, or better smells its way, for the senses of smell and taste are very closely allied, and the Snake tastes one's presence in the atmosphere.

Non-Poisonous Snakes

The Snakes of North America are divided into five great families, the Blind Snakes, the Boas, the Colubridæ, the Coral Snakes, and the Vipers. The Blind Snakes are degenerate, worm-like reptiles which burrow in the ground and feed upon worms and insect larvæ. Their defective eyes appear as mere dots under translucent shields, and apparently function only to distinguish light from darkness. Only two representatives of this family are found in the United States. These have a limited range in the deserts of the Southwest.

The Boas of the United States have not the gigantic proportions of their relatives in South American and the Old World. Only three species occur within our area, and none attains the size of even our Black Snake. The Boas are perhaps the most primitive Snakes. They possess a simple skull structure and retain rudiments of the hind limbs, projecting through the skin as a pair of spurs. Snakes are closely related to the lizards, and have apparently been derived from them by a loss of the appendages in all but these primitive forms. All Boas have unusually fine scales, giving in the smaller species a granular appearance to the skin. Very little is known about the habits of our two American Boas. They appear to be nocturnal, burrowers, and kill their prey by constriction.

The rest of our non-poisonous snakes and many of our semi-poisonous ones belong to the great family of the *Colubridæ*. Abundant from coast to coast—the first to appear in the spring and the last to leave in the fall—are the harmless Striped Snakes, such as the Garter Snake and its more brilliant and slender relative, the Ribbon Snake. Their grayish-brown bodies have in general three longitudinal stripes of yellow or greenish. The young are born alive, sometimes as many as fifty, which accounts for the ubiquitous nature of the group. Most of their food consists of frogs, toads, and fishes.

Closely related to the Striped Snakes and similar to them in habits and distribution are the WATER SNAKES, which abound in damp, marshy localities near streams or ponds. They are agile swimmers, and can easily pursue the water creatures, such as frogs and fishes, on which they feed. They may often be seen sunning themselves on the banks, but when alarmed quickly slide into the water and conceal themselves among the weeds. Although non-venomous, they are extremely pugnacious, and if cornered they flatten their heads in a threatening attitude, secrete a disagreeable odor, and if still tormented will lunge viciously forward with wide-open mouth. Water Snakes are viviparous and have large broods which upon birth have to shift for themselves. These young Water Snakes feed largely on minnows, which they seize with nearly the dexterity of their parents. Fourteen species inhabit the United States. They may be distinguished by their unusually stout bodies and coarsely keeled scales. In the East, we have the COMMON WATER SNAKE (*Natrix sipedon*). The adult is brown above, creamy white below, with a series of reddish spots on belly and tail. The common Water Snake of the South and one of the most abundant reptiles is the BANDED WATER SNAKE (*Natrix fasciata*). It is this reptile which is commonly mistaken for the poisonous COTTON-MOUTH MOCCASIN (*Agkistrodon piscivorus*). The latter, however, can be distinguished by a deep pit between the eye and the nostril and by the presence of black or gray spots on the abdomen rather than reddish ones.

Courtesy of the American Museum of Natural History

COMMON GARTER SNAKE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

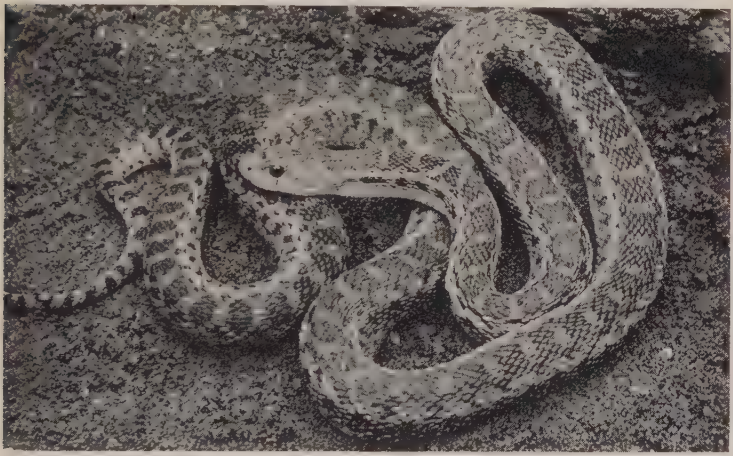
Another group of well-known Snakes has been popularly called the RACERS, because of the speed with which they glide through the grass and woods. Although large and powerful, they are slender in form, graceful in movement, and good-natured in captivity. Their food, which ranges all the way through birds, mammals, frogs, lizards, fish and smaller Snakes, is grasped with the powerful teeth and held to the ground by a portion of the body while the gradual process of swallowing takes place. The largest of the group, the GOPHER or INDIGO SNAKE (*Drymarchon corais couperi*), is found in the Southeast. It sometimes attains a length of eight feet, and receives the more common name from its habit of seeking shelter, when pursued, in the holes of the Gopher Turtle. It has, however, little fear of man, and seems to enjoy being petted by its human neighbors. The common Racer of the East is the BLACK SNAKE (*Coluber constrictor*), a useful ally of the farmer in destroying rats and mice. The Black Snake is commonly confused with the PILOT BLACK SNAKE (*Elaphe obsoleta*), of an entirely different group. The latter is a sluggish tree climber, found chiefly in the mountainous regions, and often called the Mountain Black Snake. Unlike the common Black Snake, it feeds largely on birds, but is useful in destroying many rodents. It may be distinguished from the former by its keeled scales dorsally. In the West, the Black Snake is replaced by the BLUE RACER (*Coluber constrictor flaviventris*), a slenderer and smaller Snake. In the South, is the well known COACHWHIP (*Coluber flagellum*), the fiercest in captivity and the speediest of all the Racers.

Courtesy of Doubleday, Page & Co.

BLACK SNAKE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

The BULL SNAKES (*Pituophis*) are the most docile and gentle of all the large Snakes of our country. They attain the greatest size of all our harmless Snakes, and are also useful to the farmer. They receive their name from their habit of hissing loudly when annoyed. If the intruder is not frightened by the hisses, the Snake becomes quiet, and even when handled does not strike. Bull Snakes feed not only on mice and the smaller rats, but also on such mammals as the squirrel and the rabbit, which they kill by constriction. Birds' eggs are an especial delicacy and are swallowed whole for about fourteen inches, when the shell is broken by muscular contraction and digested with the rest of the egg. The Common Bull Snake (*Pituophis sayi*) is a native of the central States. Its great yellow body with black or chestnut blotches is often exhibited in the side shows of circuses as a "very dangerous serpent." This species is replaced by the Pacific Bull Snake (*Pituophis catenifer*) in the extreme West and by the Pine Snake (*Pituophis melanoleucus*) in the East. The latter is white with brown or black spots, and is found abundantly only in the pine barren region.

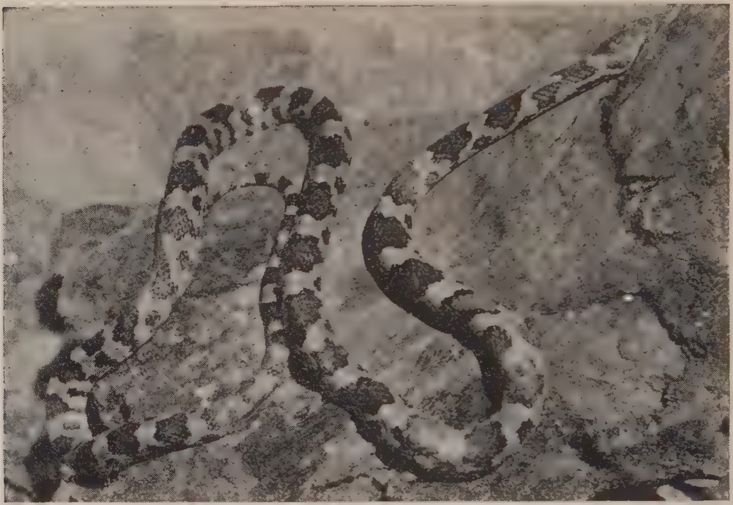
Courtesy of Doubleday, Page & Co.



WESTERN (OR PACIFIC) BULL SNAKE
FROM A PHOTOGRAPH BY RAYMOND L. DITMARS

There are two medium-sized Snakes, slender and graceful in form and a grassy-green in color, which are generally spoken of as Green Snakes. In the Northeast the Smooth Green Snake (*Liopeltis vernalis*) is abundant and may be identified by its smooth scales and its purely terrestrial habits. Unlike most Snakes, it feeds almost entirely upon insects and spiders. In the South and West, the Rough Green Snake (*Opheodrys* *aestivus*) is found. It is essentially arboreal and is very fond of vines. Its keeled scales apparently aid it in gliding through the vines as it searches for insects on which it feeds.

An interesting and widely distributed group of Snakes in America is the King Snakes, which receive their name from their cannibalistic habit of feeding on other Snakes. Their strong bodies are well adapted for their semi-burrowing habits, and enable them to enter the holes of small mammals, which they swallow after crushing by constriction. The different species vary in size from fourteen inches to nearly four feet. They are ornamented with the most diverse patterns. The Common King Snake (*Lampropeltis getulus*) of the East is the largest of the group in the United States. In the Southeast, the Scarlet King Snake (*Lampropeltis elapsoides*) is often confused with the poisonous Coral Snake, but may be distinguished by having broad red and yellow stripes divided by narrow black bands instead of red and black stripes separated by yellow. The Milk Snake is also a member of the genus of King Snakes. It frequents barns and dairies, but does not, as often claimed, steal milk from the cows. In captivity, it will steadfastly refuse milk and feed voraciously on mice and small rats.



MILK SNAKE

From a photograph by Herbert L. Lang of the American Museum of Natural History

The Hog-nosed Snakes (*Heterodon*) are incurable bluffers. Though

MILK SNAKE AND EGGS
From a photograph by Herbert Lang of the American Museum of Natural History

HOG–NOSED SNAKE
From a photograph by Herbert Lang of the American Museum of Natural History

small in size and in reality quite peaceful in disposition, they give an appearance of fierceness and rage when in any way disturbed. They are sometimes called Puffing Adders, because of their habit of hissing loudly when disturbed and of flattening the head to nearly twice its natural width. If this does not succeed in discouraging the intruder, the Snake feigns a spell of convulsions and rolls over on its back as if dead. Yet a little knowledge is often worse than none at all, and the Hog-nosed Snake often defeats itself at its own game. When a person turns the limp creature back into its natural position, it will immediately prove himself very much alive by turning over on its back, its approved position of "being dead." The upturned snout of this Snake is characteristic of the genus. The four species of the group frequent chiefly sandy or at least barren regions. Our eastern form, *Heterodon contortrix*, feeds almost exclusively on toads.

Poisonous Snakes

Our poisonous Snakes are divided into three main groups. The first, Opisthoglypha, is a specialized section of the great family Colubridæ, to which most of our non-poisonous Snakes are referred. This section is distinguished by having one or more pairs of the posterior teeth of the upper jaw enlarged and bearing narrow grooves down which poison may be conducted into the wound. As these fangs are in the back of the mouth they are seldom used, and no record has been made of the bite of an American Opisthoglyph proving harmful or even painful to man. The chief genus, *Tantilla*, includes a number of small burrowing Snakes widely distributed across the southern and western States, but rarely seen.

The second or Elapine group have the front teeth of the upper jaw grooved to conduct the poison. These Snakes are placed in a separate family, Elapidæ. To this group belong the Old World Cobras, many Sea Snakes of tropical waters, and the Coral Snakes of the neotropics. The Coral Snakes are small and very brightly colored, with broad bands of red and black separated by narrow bands of yellow. Although they are poisonous, they have such small mouths that they can rarely bite deep enough to harm a man. Unlike most poisonous forms, they are burrowers, coming to the surface only during the night, when they wander about in search of small harmless Snakes on which they feed.

The third group, and by far the most dangerous, of poisonous Snakes, is the family Viperidæ. The Snakes of this group, the Rattlesnake, Copperhead, Water Moccasin, etc., have the poison fangs highly specialized. When the mouth of the Snake is closed the fangs are folded back and lie along the roof of the mouth. When the mouth is opened, the jaw bones push against bones which in turn rotate the fangs so that they protrude out almost at right angles to the upper jaw. These teeth are hollow tubes and are connected by means of small ducts to poison sacs just behind the eyes. By voluntary action the muscular wall of the sac is contracted and the poisonous fluid forced out through the teeth into the open wound. In a medium-sized Snake about half a teaspoonful is ejected at one time. Behind these fangs there are other fangs continually developing. Thus, when the functional ones are removed by force or are naturally shed, one of the rudimentary pairs immediately develop and function in their place. Viperids have stout bodies, stubby tails, vertical cat-like pupils, and a flattened, heart-shaped head similar to the Water Snakes. Those in the United States have a deep pit between the nostril and the eye, the function of which is a much-debated subject. It seems probable that the facial pit is an accessory hearing organ. Snakes with this facial pit are called PIT VIPERS. Most viperids are very nervous creatures, delicately adjusted to their environment. They do not strike unless molested or seeking prey. No poisonous Snake can strike very far, certainly not more than half the length of its body.

The RATTLESNAKE is known by name if not by personal acquaintance to all of us. Fourteen species are found in the United States, all being easily identified by the "rattle" at the end of the tail. Each time the skin is shed, there is left a little cap of skin at the end of the tail. After several molts, these successive caps, fitting loosely one into the other, form an effective rattle. The DIAMOND-BACK RATTLER (*Crotalus adamanteus*) of the Southeast is the largest Rattlesnake in the world. Although it often grows to eight feet in length and develops fangs an inch long, its aggressiveness is not in proportion to its size. People have been known to step on this Rattlesnake and to have it pull away without striking. The common representative of the East, the BANDED or TIMBER RATTLER (*Crotalus horridus*) seldom attains a length of more than four feet. It is not as poisonous as some of the other species. The PYGMY RATTLER is the smallest of the group, and unlike most of its kind is a swamp dweller. Its bite, though painful, is not generally considered fatal. The PACIFIC RATTLESNAKE (*Crotalus oregonus*) is common on the western coast, often inhabiting mountainous regions to high altitudes. Like most Rattlesnakes, it lives on small rodents and other mammals sufficiently small to be swallowed.

The COPPERHEAD (*Agkistrodon mokasen*) is very shy but readily identifiable by its pinkish-brown color crossed with dark reddish-brown dumbbells. The head is of a distinctly coppery tinge. It is most frequently found in rocky, wooded regions of the eastern and central States. Although it has no rattle, it will, like the Rattlesnake, vibrate its tail when annoyed, producing a threatening buzz if the tail happens to strike any leaves.

The WATER OR COTTON-MOUTH MOCCASIN (*Agkistrodon piscivorus*), is a close relative of the Copperhead. It is our only true Moccasin, although many water Snakes are erroneously called by that name. It is even less prone to strike than the Copperhead, and fishermen of the South often step on or over a Water Moccasin with impunity. The streams of our southland offer the Moccasin a retreat where, armed with its deadly apparatus, it seeks only to prey on fishes, frogs, or small mammals.

In conclusion, a word may be said as to the treatment of snake-bite. In the United States, only the Rattlesnakes, the Water Moccasin, and the Copperhead will in general prove dangerous to man. The bite of any of these snakes may be recognized by the single pair of wounds formed by the two fangs. Non-poisonous water Snakes leave scratches on biting, but these are numerous and irregular in form. If one is bitten by one of the three poisonous Snakes mentioned above, he should at once tie a ligature around the first single bone between the wound and the body. Thus, if one is bitten in the heel, the ligature should be applied around the leg above the knee. Next open the wound slightly with a clean instrument and try to suck out as much of the poison as possible. If one is near a place where potassium permanganate can be secured, he should prepare a concentrated solution in pure water and inject with a hypodermic needle a quantity into the wounds formed by the fangs. The ligature should then be loosened, for if allowed to remain more than half an hour, complications would result. Finally, if one is suffering at all from the bite, he should go to a hospital where the wound will be bathed well with permanganate; and anti-venom serum, such as that manufactured by the Institute of Butantan, Brazil, will likely be injected into the muscles of the stomach. Viperid venom destroys the capillaries, and, if allowed to act sufficiently, will cause death from internal hemorrhage. There is no reason, if care is exercised, why death should result from even the most serious bite.

AMPHIBIANS

ADAPTED FROM W. SAVILLE-KENT, F.L.S., F.Z.S.

FROGS AND TOADS

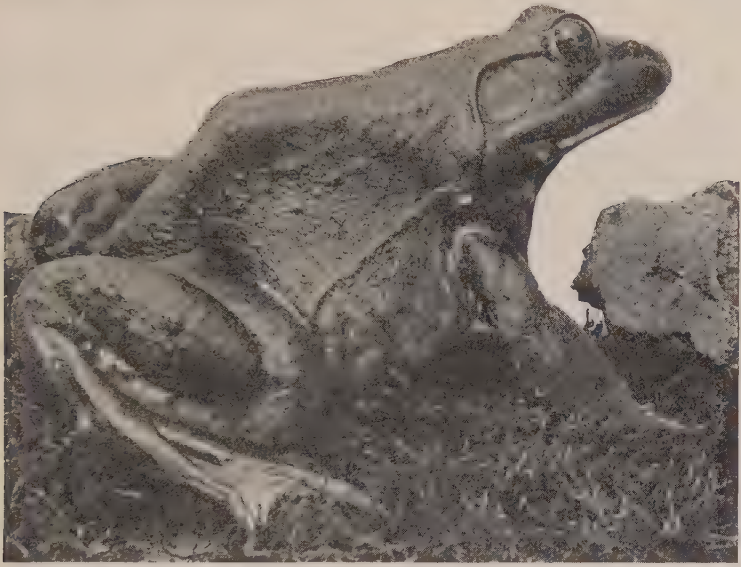
THE Amphibian Class, through the Newts and Salamanders more especially, would appear at first sight to have much in common with and to be most closely allied to the Lizards, previously described. As a matter of fact, however, the group is much more nearly related to the Fishes. The most striking feature in the Amphibians that points to this relationship is the fact that for a certain period of their existence their breathing organs take the form of gills, structures not found in any other back-boned animals higher than the fishes. Another important character of the Amphibia is the fact that they all pass through a larval condition before arriving at the adult state. The familiar tadpole phase of the common Frog or Toad typically illustrates this point. During its earliest larval state the fish-like resemblance is especially plain. In addition to possessing gills, the body is limbless and produced into a long fish-like tail, having upper and lower fin-like membranes, with which the little animal propels itself through the water. These fins, however, are never furnished with supporting fin-rays, as obtains among the Fishes.

TADPOLE OF BULL-FROG
FROM A PHOTOGRAPH BY R. W. SHUFELDT

Unlike that of the Lizards and Snakes, the skin of Amphibians is never covered with spines or scales but is soft and naked. In many of the Toads and Salamanders the surface of the skin is, however, warted and highly granular, and capable of producing an irritating and sometimes poisonous fluid. Moisture is essential for the well-being of all Amphibians. The eggs are deposited, and with but few exceptions, the earlier or larval conditions are passed in the water, while the adults remain near-by, and frequently take up their abode in it. The deeper and more important details of the bones of the Amphibia differ greatly from those of the preceding groups. The backbones in those species which always retain the gills can hardly be told from those of fishes. In the Frog and Toad Tribe, on the other hand, they are reduced to a less number, seven or eight only, than is found among any other back-boned animals, while ribs do not exist or are incomplete and useless throughout the class. Many bones in the skull of the Amphibia, as well as its general construction, are more in accord with those of fishes than of ordinary reptiles. The tongue, not always present, is attached immediately inside the front of the lower jaw, its tip pointing down the animal's throat. It is remarkable that, notwithstanding their aquatic habits, no Amphibian has been discovered which frequents salt water.

COMMON TOAD
FROM A PHOTOGRAPH BY R. W. SHUFELDT

Amphibians among themselves form two very easily recognized sub-divisions—the one including the Frogs and Toads, collectively forming the Tailless group; and the other represented by the Newts and Salamanders, or Tailed Amphibians. The former group has an almost world-wide distribution, numbering some thousand species; it is most abundantly represented in the tropics, ranging thence in diminishing numbers to the limits of the Arctic Circle. In colder climates these Amphibia usually sleep during the winter months; while in tropical countries, where dry seasons intervene, they often bury themselves in the mud, and remain in a state of torpor till the return of the rains. The majority are more active by night than by day. Frogs and Toads commence life in an aquatic tadpole phase. While in the adult state they are strictly flesh-eaters, the tadpoles are vegetarian feeders.

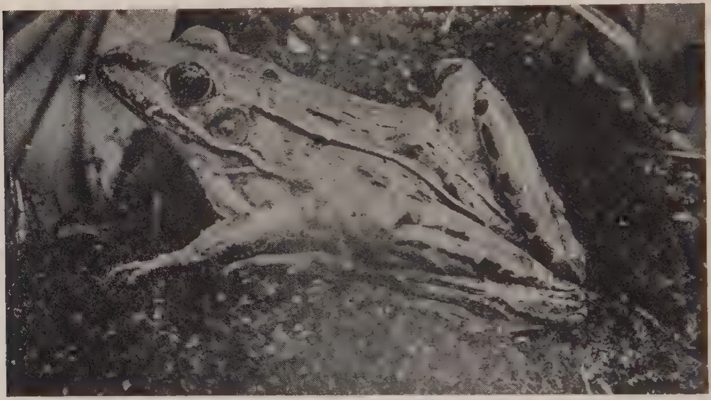


BULL-FROG
From a photograph by R. W. Shufeldt

There is a remarkable difference in the voice-timbre of the various species of Frogs. In countries like Australia, where numbers of species live close together, the difference is very marked. Some only give voice in the evening or night, while others keep up their clamor throughout the day; with some the note is metallic and almost bell-like, while one day-croaking species, which congregates in great numbers in the eastern Tasmanian coast district, emits a loud percussive note closely resembling that of a stone-breaker's hammer. On several occasions, in fact, when driving through the areas these frogs frequented, the impression produced by their croaking was so realistic that the next turn in the road was expected to reveal the presence of a large gang of road-makers engaged in breaking a wayside stone-heap.

The section to which the American Frogs belong includes over 150 species, collectively known as Water-Frogs, which present considerable differences in both their aspect and habits. While some are aquatic, others only resort to the water during the breeding-season; some are terrestrial and occasionally earth-burrowers, while yet another series is essentially arboreal.

The loudest-voiced as well as the largest of the American Frogs is the BULL-FROG of Canada and the United States. The length of the body in this species may be as much as from seven to seven and one-half inches, exclusive of the legs; and its croakings, or more correctly bellowings, are so loud that it may be heard for a distance of several miles. These croakings are most pronounced during the early spring or breeding-season. In the southern United States, however, they are maintained more or less persistently throughout the year. While the British Frog contents itself with a diet of slugs, worms, beetles, and other insects, the Bull-frog aspires to larger prey, and has an especial fondness for young ducklings. As a compensation the flesh of the Bull-frog is very delicately flavored, and the species is so much esteemed in some localities as to be kept in captivity and fattened for the table. It has been recorded that the Bull-frog makes leaps of from eight to ten feet in length and five feet in height.



SOUTHERN LEOPARD FROG
FROM A PHOTOGRAPH BY R. W. SHUFELDT

The POND or GREEN FROG is the most abundant of American Frogs, It is considerably smaller than the Bull-frog, and is further distinguished by its proportionately smaller head. It is much sought by epicures, and has been so persecuted by market hunters that it is now protected by law in many localities.

The PICKEREL FROG and the LEOPARD FROG, commonly called "Grass Frogs," both are strongly marked with dark spots, so that their identity is often confused. The former, however, has the spots more or less square, and is bright yellow on the lower surface of the hind legs, while the markings of the Leopard Frog are rounded and the lower surface is white. Both species spend much of their time in marshy meadows, often far from water.

The WOOD FROG, one of our smallest species, is colored in soft shades of brown, with a distinctive black mark on each side of the head. It lives in damp woodlands, keeping to the ground, and enters water only during the mating season.

WOOD FROG
FROM A PHOTOGRAPH BY R. W. SHUFELDT

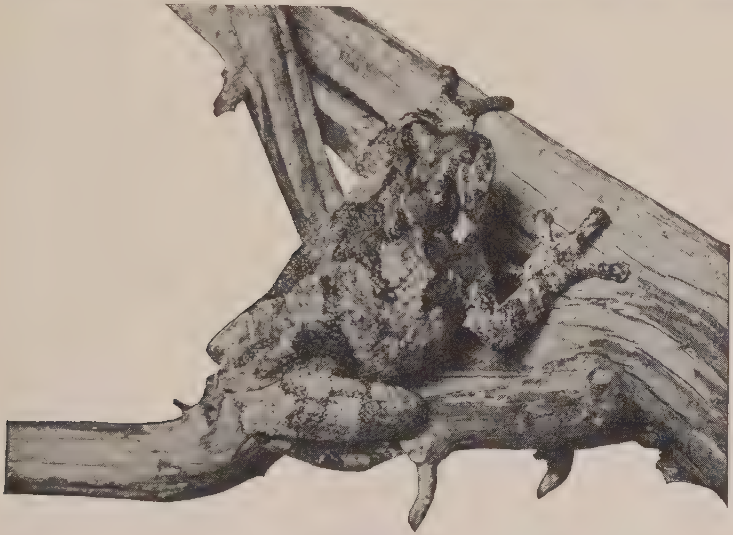
Of foreign Frogs, one of the most remarkable species is the FLYING-FROG of Java. The power of flight is accomplished in this instance on a different principle to that which obtains in any other group. It is not done through the medium of strangely developed ribs with connecting membrane, as occurs in the Flying-lizards; nor by means of a flap of skin stretched between the fore and hind limbs, as in the Flying-squirrels and Phalangers. In place of these the toes of all four feet are greatly lengthened, and the spaces between bridged over to their tips by webbing. The body of this Frog is about four inches long, while the webs of the feet, when fully expanded, cover collectively an area of fully twelve square inches; they thus form aerial floats, which enable their owner to make long flying leaps among the trees in which it takes up its abode. The colors of this singular species are striking; the back and limbs are a deep shining green, the under-surface and inner toes yellow, and the webs black rayed with yellow. In common with the typical Tree-frogs, the toes of this Javan flying variety all end in an enlarged sticking disk.

Among the oddities of the Frog Tribe prominence may be given to the singular SHORT-HEADED FROGS of East Africa. In these the head is so short, and the body, when puffed out, so nearly globular, that they have been aptly described as more nearly resembling india-rubber balls than Frogs. Another notable form, inhabiting Chili, is remarkable for the fact that the throat-sac of the male is so enlarged and modified as to form a chamber on the under surface of the body. In this sac the eggs laid by the female are deposited and pass through their tadpole phases.

The HORNED FROGS, or HORNED TOADS, of South America form a distinct and interesting group. They are of large size, stout and rotund, gorgeously appareled, and aggressive in bearing. There are nearly a dozen known species, the distinctive feature from which they take their name having reference to the stiff, horn-like development of their upper eyelids. The largest species is a native of Brazil, whose body may be as much as eight inches long. This species has the horn-like processes of the eyelids most prominently developed. A somewhat smaller but boldly handsome species is plentiful in the Argentine Republic. In this animal the body is relatively more squatty and toad-like than in the Brazilian form, but the horn-like angle of the upper eyelid is only slightly produced. The colors vary somewhat, the general ground-tint of the upper-surface is bronze-green or yellow, upon which are distributed large spots and blotches of dark olive or chocolate, having light yellow or golden margins. The spots on the limbs are the widest, and almost take the character of cross-bands. Bright claret-red lines are sometimes developed in and among the body-spots.

A very interesting account of the habits of this Frog appears in Mr. W. H. Hudson's "The Naturalist in La Plata." Mr. Hudson reports it as being common on the pampas as far south as the Rio Colorado in Patagonia. In the breeding-season it gathers in pools, and displays extraordinary vocal powers, which are exercised at night. The notes uttered are long, resembling those of a wind instrument, and are so powerful that on still evenings they may be heard distinctly a mile off. After the pairing-season the Frogs disperse, and, retiring to moist places, bury themselves just deep enough to leave their broad green backs on a level with the surface. The eyes, under these conditions, look out as from a couple of watch-towers, and are on the alert for any approaching prey. This consists of any moving creature which they can capture, such as other frogs and toads, birds, and small mammals. In very wet seasons they will frequent the neighborhood of houses, and lie in wait for chickens and ducklings, often capturing and attempting to swallow objects much too large for them. In disposition they are exceedingly pugnacious, savagely biting at anything that comes near them. When teased, one of these creatures swells itself out to such an extent that one expects to see it burst. It follows its tormentors about with slow, awkward leaps, its vast mouth wide open, and uttering an incessant harsh croaking sound. When they bite, these Frogs hold on with the tenacity of a bulldog, poisoning with their venom the blood of the creature seized.

The Tree-frogs represent one of the most distinct groups of the tribe. All its members are more or less arboreal in their habits, repairing to the water only during the breeding-season, or leaving the trees to seek shelter in the earth or underneath stones or timber for the purpose of sleeping. As an adaptation for their special habits, the toes of the Tree-frogs are provided at their tips with sucking disks, so that they can walk on perpendicular or smoothly-glazed surfaces after the manner of the Geckos among the Lizards. Another characteristic feature is the development on the under surface of their bodies of peculiar granular glands, pierced by numerous pores, through the medium of which they rapidly absorb the moisture deposited by dew or rain on the surfaces of the leaves among which they live. The colors of the Tree-frogs harmonize, as a rule, so completely with those of their leafy surroundings that their presence very readily escapes detection. Many of the species, moreover,



TREE FROG
From a photograph by R. W. Shufeldt

rival the chameleon in their capacity of quickly adapting their tints to that of a newly occupied surrounding. Green is naturally the dominant ground-tint of these frogs. Often, however, it is intermixed with stripes and bands of other colors, while sometimes the green hue is entirely replaced, as in the Blue, or Bicolored, Tree-frog of South America, which is brilliant azure above and pure white beneath. A very beautiful Australian species, abundant in Tasmania and Victoria, and appropriately named the Golden Tree-frog, has its grass-green overcoat thickly overlaid and embroidered with, as it were, the purest beaten gold.

The South American and other Tree-frogs deposit their eggs in the water, some species constructing a smooth crater-like nest of mud for the reception of the eggs and tadpoles. Certain kinds, however, never leave the trees, having adapted their requirements to the naturally-provided surroundings. Thus one Brazilian species deposits its eggs in the water almost invariably contained in the central cup of a tree, while another allied Frog chooses for the same purpose the moist spaces at the bases of decaying banana leaves. A step further, resulting in complete independence of water, is arrived at by the Marsupial or Pouched Tree-frog of Central America. In this species the female develops a capacious pouch on her back, which opens backward, and wherein both the eggs—primarily assisted to their position by the male—and tadpoles undergo their characteristic changes.

The two commonest Tree-frogs of North America are the SPRING PEEPER (*Hyla crucifer*) and the COMMON TREE-FROG (*H. versicolor*). The former is very small, seldom exceeding an inch in length, while the latter is about two inches long. Both are common throughout the eastern United States, and are noted for their color changes.

Toads are distinguished from Frogs by their sluggish, creeping movements. There are over eighty species, having collectively an almost cosmopolitan range, though they are not found in Australia, New Guinea, Madagascar, or the Pacific Islands. With many persons they are unwarranted objects of aversion, and in country districts are not infrequently credited with venomous properties. Toad-spawn is plentiful in ponds and ditches in the early spring, and may be distinguished from that of the Frog by the fact of its being deposited in chain-like strings, the eggs being arranged in a double alternating row, instead of in irregular masses, as obtains with the last-named species. The individual eggs, moreover, are smaller, and deposited two or three weeks later in the season than those of the Frog.

The best-known Toads of North America are the AMERICAN TOAD (*Bufo americana*) and FOWLER'S TOAD (*B. fowleri*). The two species are very similar, but are distinguished by the generally smoother skin, smaller head glands and lack of reddish pigments of the latter. Besides the foregoing, there are thirteen other forms of toads credited to North America.

NEWTS AND SALAMANDERS

THE Newts and Salamanders, or Tailed Amphibians, differ from the group of the Frogs and Toads in the fact that the tail is retained throughout life. In this manner they very nearly resemble the advanced larva or tadpole phases of the latter. In some instances, in fact, the earlier or gill-bearing tadpole phase is persistent. The distribution of the Salamander Tribe is much less extensive than that of the Frogs and Toads, but few are found south of the Equator, and they are entirely unknown in Australia or in Africa south of the Sahara.

The eggs, or spawn, of the Newt are deposited in a different fashion to those of the Frog and Toad. In place of being gathered together in an irregular or ribbon-like mass, each is deposited separately and attached to the leaves of water-plants. By the skillful use of its feet, the female Newt twists or folds the leaf, or a portion of it, around the eggs, its sticky envelope allowing it to readily adhere, and it is thus effectually concealed or protected from injury. When about a quarter of an inch long, the tadpole escapes from the eggs. At this early stage the gills are quite simple, and the front limbs represented by mere knobs. Immediately in front of the gills are two fleshy lobes, by means of which the tadpole can temporarily adhere to the surfaces of water-plants. Within a fortnight the little animal has grown to double the size. The gills are now elegantly branched, and the fore limbs well developed. The latter are, however, only divided in two at their extremities, and it is some little time later that four distinct toes are possessed by each fore limb, and that the hind limbs make their appearance. The gills, which have at this stage reached their most complex state of development, now begin to diminish in size, and are gradually absorbed, the lungs in the meantime acquiring their full action. The Newt, having now passed from the fish-like to a reptilian stage, is unable to live entirely beneath the water, and is obliged to come up to the surface at intervals to breathe, or is adapted for living entirely upon land. Newts in their fully matured state, except during the breeding-season, pass much of their time on land, and wander to considerable distances from the water. They at all times, however, exhibit a preference for moist situations, such as a shady wood or damp cellar.

Like the Toad and Blind-worm, the feeble, inoffensive Newt has from the earliest time to the present day been the victim of the most unmerited dread and persecution among the uneducated. In some country districts it is not only credited with the property of biting venomously, but of spitting fire into the bitten wound. A property that is actually possessed by these creatures is that of reproducing lost parts. The Geckos and other lizards are in the habit of reproducing their injured tails. The Newt, however, beats that record to the extent of reproducing lost legs, and, it has been affirmed, eyes also.

There are four forms of Newt in North America. The COMMON NEWT, or WATER NEWT (*Notophthalmus viridescens*), is found in eastern North America as far west as Oklahoma and Texas. It is two or three inches in length and light-olive in color. In this form it lives in water, but there is a land form which is brilliant scarlet in color. The CALIFORNIA NEWT (*N. torosus*) is very much larger.

COMMON, OR WATER, NEWT
FROM A PHOTOGRAPH BY R. W. SHUFELDT

Salamanders go to the water to breed, after the manner of Newts, but the young are usually brought forth alive, though occasionally eggs are deposited, from which the young Tadpoles almost immediately emerge. The number usually produced at a birth ranges from sixteen to thirty, but instances are recorded where there have been as many as fifty.

About seventy kinds of Salamander are found in North America. Some are dull in color, like the BROWN SALAMANDER, or DUSKY SALAMANDER (*Desmognathus fuscus*), and others are strikingly brilliant, like the SPOTTED SALAMANDER (*Ambystoma maculatum*), which is bluish-black, with small yellow spots.

A representative of the tribe now commonly kept in aquaria is the Mexican Axolotl, or Tiger Salamander (*Ambystoma tigrinum*). It has usually a velvety black skin, and grows to a length of nine or ten inches. As generally known it presents a very Newt-like aspect, or, more correctly, that advanced tadpole state of the Newt in which the gills are most highly developed. The animals breed freely in the water, eggs being laid which pass through the earlier tadpole to the adult phase.

CALIFORNIA SALAMANDER
FROM A PHOTOGRAPH BY R. W. SHUFELDT

Up to within comparatively recent times the foregoing changes were supposed to represent the first and last of the animal's existence. Some exceptional examples, however, bred in an aquarium in which rocks projected out of the water, surprised their owners by gradually absorbing their supposed persistent gills, also their fin-like tail-membranes; and, crawling out on the rocks, were transformed into ordinary Tiger Salamanders.

WHAT THE BURDOCK WAS GOOD FOR

"Good for nothing," the farmer said,
As he made a sweep at the burdock's head;
But then, he thought it was best, no doubt,
To come some day and root it out.
So he lowered his scythe, and went his way,
To seed his corn; to gather his hay;
And the weed grew safe and strong and tall,
Close by the side of the garden wall.

"Good for a home," cried the little toad,
As he hopped up out of the dusty road.
He had just been having a dreadful fright—
The boy who gave it was yet in sight.
Here it was cool and dark and green,
The safest kind of a leafy screen.
The toad was happy. "For," said he,
"The burdock was plainly meant for me."

Nothing is lost in this world of ours;
Honey comes from the idle flowers;
The weed which we pass in utter scorn
May save a life by another morn.
Wonders await us at at every turn,
We must be silent, and gladly learn
No room for recklessness or abuse,
Since even a burdock has its use.

INSECTS

By OLIVER PERRY MEDSGER, B.S.

I love to hear thine earnest voice,
Wherever thou art hid,
Thou testy little dogmatist,
Thou pretty Katydid!
Thou mindest me of gentlefolks,—
Old gentlefolks are they,—
Thou say'st an undisputed thing
In such a solemn way.
—OLIVER WENDELL HOLMES.

FOREWORD

INSECTS may be distinguished from other creatures in having the body divided into three regions—head, thorax, and abdomen—three pairs of jointed legs, a pair of antennæ, or feelers, and when mature they generally have one or two pairs of wings. They breathe air through tubes which penetrate the interior of the body. The skin-like covering of an insect often contains a hard, horny substance called chitin, which gives firmness to the body, protects the soft internal parts, and makes possible the attachment of wings and legs. The body is made up of rings or segments which are prominent on a caterpillar or grasshopper but quite obscure on a honey bee or fly. The segments are often referred to in describing insects.

So many people go through the world and rarely see the numerous creatures all around them! Insects may be found almost anywhere and everywhere. The number of species are far more numerous than that of all the other animals taken together, and the individuals of one kind are sometimes so numerous as to become destructive pests, as in the case of the migratory locust, the army worm, or the gypsy moth.

The mouth parts of some insects are adapted for biting, others for sucking and lapping. Their food also shows the greatest variation. The food of the young is often very different from that of the mature insect, as observed in the caterpillar and the butterfly. Many species make use of the leaves of plants, others feed on dry or decayed wood, some flies and beetles feed on carrion or filth, bees and butterflies take the nectar from flowers, the female mosquito feasts on blood, the weevils eat the starchy food of seeds, and the young of the clothes moth destroys our finest carpets and rugs.

Insects go through changes of form in their development. This is called metamorphosis—a long word, but it is used so often that we want to remember it. We say insects have complete metamorphosis if the change from one form to another is distinct. A moth is a good example of this, as it passes from a caterpillar to the chrysalis and then to the mature insect. The young grasshopper resembles its parents in many respects, so we say it has incomplete metamorphosis.

A few insects are born alive, but the great majority are developed from eggs. The young of the common house fly come from the eggs in a day or two after they are deposited, but in the case of the grasshopper or locust, the egg stage lasts for eight or nine months, except for those species that have two broods a year.

From the egg, the insect passes into the larval stage, where it eats ravenously, often consuming several times its own weight in a day. In this period of its life it generally grows rapidly, and often completes this stage in a week or two. Some species, however, develop slowly. The seventeen-year locust, or cicada, spends nearly its whole life as larva beneath the surface of the ground. The caterpillar is the larva of a butterfly or moth. It is often erroneously called a worm. The word grub is often applied to the young of beetles, bees, and wasps. The larva of a fly is called a maggot, and we use the word nymph for the young of grasshoppers and dragon-flies.

From the larva, the insect passes into the pupa state, a semi-dormant condition, where it does not eat but gradually changes into the mature insect. Those that have incomplete metamorphosis do not pupate. The pupa of a butterfly or moth is called a chrysalis. The caterpillars of some moths spin a silken cocoon about the body as a means of protection. If this silken case is opened, the real pupa is seen within.

The adult is the mature form of an insect. It never grows after reaching this stage. The caterpillar molts or changes its skin a number of times to admit of growth, but a mature insect never molts. Nearly all adult insects have wings, but there are some exceptions to this. Many species of full-grown insects eat but little, for they take food only to sustain life and not to grow. Some have lost their mouth parts and ability to take food. Many kinds live but a short period in the adult form. The nymph of the May-fly spends from one to three years beneath the surface of the water, but the mature insect flits about in the sunshine and often lives but a few hours or a day at the longest.

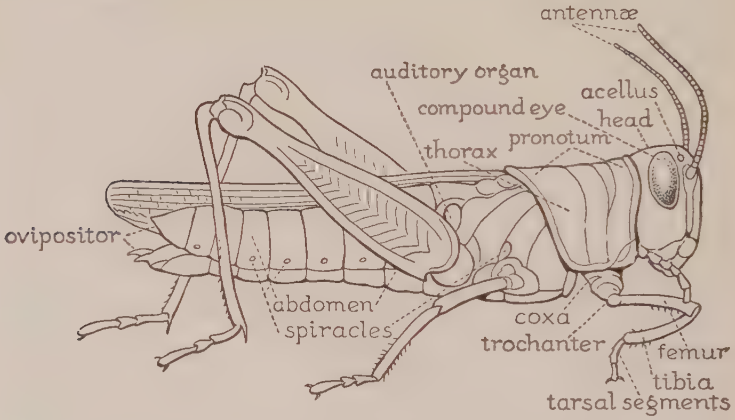
The antennæ are two feeler-like organs of an insect in front and between the eyes. They are jointed, and vary wonderfully in shape. Those of the house-fly are short. In the meadow grasshopper they are thread-like and longer than the body. Many species of moths have feathery antennæ. In the great majority of butterflies they are enlarged or club-shaped at the end. Probably all insects use the antennæ as feelers or organs of touch. In moths and butterflies, the sense of smell is also located in the antennæ.

Insects have the special senses of touch, taste, smell, sight, and hearing. With many species, as those of butterflies, moths, bees, flies, and certain beetles, the sense of smell is very acute, and it is by this means that they find their food and each other. I once placed some female Promethea moths in a wire cage and hung it out in the breeze. It was not long before male moths of the same species came flying over the tree-tops and hovered about the cage. This method has been used in capturing moths, and it is believed that some species are attracted by this means for a mile or two.

The sense of taste is probably quite acute in ants, bees, and wasps. We know that butterflies prefer the nectar of some flowers to that of others. The grasshopper is not so particular and will chew the handles of forks and rakes if the farmer leaves them out in the field for a day or two. I have seen fork-handles made very rough by the biting jaws of grasshoppers.

Many insects have the power of making sound, which would also indicate that they have ears or some arrangement for hearing. The ears of the grasshopper or locust are at the base of the abdomen, and those of the cricket and katydid are on the front legs. The hairs on the antennæ of mosquitoes are believed to be organs of hearing.

Insects probably have good eyesight at short range, but it is doubtful if they have clear vision at a distance. They have two kinds of eyes, simple and compound. Most species have both kinds, but some have only one form, and a few have no eyes at all. Where insects are without eyes, it means that they are degenerate species and have gradually lost them. The simple eyes, usually two or three in number, are small and are probably used only to distinguish light from darkness. The compound eyes are large, one on each side, and they often occupy the greater part of the head. When looked at with a microscope they are seen to be made up of numerous six-sided figures which are in reality distinct eyes. The compound eye of an ant is composed of about fifty small eyes, while in that of a dragon-fly or butterfly there are many thousand. The compound eyes are round or convex in form, and this enables



LOCUST

the insect to see in all directions. It is generally believed that the range of vision extends for two or three yards, but my experiments with hornets, when a boy, would indicate that they can see clearly at a greater distance.

The question is often asked, how do insects spend the winter? The answer depends upon the kind of insect we are considering. The nymphs of dragon-flies and similar aquatic insects live on the bottom of ponds and streams. The larvæ of many beetles pass the winter beneath the surface of the ground. Of the bumble-bees and social wasps, the males and workers die in autumn. The females crawl away to some protected place and remain there during the severest weather, coming forth in the spring uninjured. Solitary bees and wasps generally spend the winter in the larval stage. The majority of our butterflies and moths pass the cold season in the pupa state. The Mourning-cloak butterfly hibernates in the adult stage in protected places such as under stumps that are lying loose upon the ground, and the Monarch or Milkweed butterfly wings its way to the south like a migratory bird. On almost any winter day, especially if the ground is free from snow, it would be possible to gather dozens of species of insects if we knew just where to look. In the summertime, they may be found in abundance in every piece of waste-land or vacant lot. A friend of mine has collected more than four hundred species on his lawn in a suburban town.

To observe insects with a microscope is a revelation, and any boy who has one of these instruments is fortunate indeed. The eyes, antennæ, wings, feet, all present a marvelous appearance, and when studied closely we see how well these organs are adapted to the life the creature leads. But a microscope is not really necessary to a knowledge of this subject. It is only an aid. To know the name, structure, and appearance of an insect is good, but to know what it does, and how and why, is better. There is much that we do not know about the habits of even familiar species, and any observing boy who wishes to take the time and trouble can add to our knowledge of these, probably the most interesting of all forms of life.

The line-drawing which illustrates this section was made by George A. King.

BRISTLE-TAILS AND SPRING-TAILS

ORDER *Thysanura*

THE members of this order are the most primitive of insects. They are minute, soft bodied, and wingless, and pass through no distinct changes in their development.

The form we are likely to find is called BRISTLE-TAIL or FISH-MOTH (*Lepisma saccharina*), but it is not a Moth. Its body is covered with small silvery scales. It is about one-third of an inch long, runs rapidly, and avoids the light. It is found in households nearly all over the world. It feeds on sweet substances and starch. It attacks book bindings, and often loosens wall paper by eating the starch.

FISH-MOTH
(*After Howard and Marlatt*)

The SPRING-TAILS form another group of this order They are tiny black creatures, almost microscopic, and bent beneath the body is a spring-like arrangement which when straightened out throws the tiny creature into the air. They feed on decaying vegetation. Sometimes thousands cover the surface of pools, and they can be seen as tiny black specks on snow in early spring. They can probably be best obsrved on decaying mushrooms, where they often collect by hundreds. Touch them with a pencil and they immediately spring away. They sometimes prove a nuisance in collecting about the vessels containing sap in maple-sugar camps. Sometimes they are found abundantly on the leaves of young cabbage plants.

POND-SURFACE
SPRING TAIL
(*After Schött*)

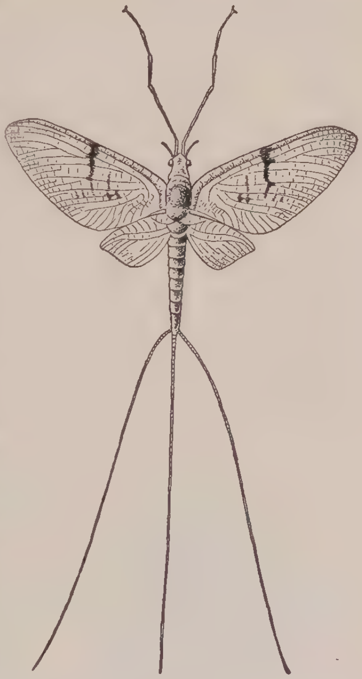
MAY-FLIES

ORDER *Ephemerida*

THE insects of this order are called MAY-FLIES, or SHAD-FLIES, and in some parts of the country the name EEL-FLY is used. They have delicate membranous wings, with a fine network of veins. The fore-wings are large, the hind-wings small and in some species absent. There are two or three thread-like filaments on the tail. The mouth parts are rudimentary. Metamorphosis is incomplete.

May-flies are very common insects along lakes, rivers, and ponds. They are found over the entire country, but are especially common around the Great Lakes. Often thousands of them gather about the street-lamps, where they flit about and finally fall lifeless upon the ground. For several years, I spent my summers in a cottage on the shores at the east end of Lake Ontario. Every morning during June we had to sweep them off the porch. Their thousands of dead bodies often literally covered the floor. Removing them from the screen doors and windows was even worse.

The eggs are dropped upon the surface of the water, or in some cases placed beneath it. They settle to the bottom and soon hatch into flattened, soft-bodied nymphs, which crawl about the mud or cling beneath the stones. After molting, that is shedding the skin, for nine or ten times, tiny rudimentary wings appear. Respiration is carried on by leaf-like gills. The nymph becomes full grown after molting about twenty times, which requires a year, and in some species two or three years. It then rises to the surface of the water, and while floating, the skin splits on the back and almost instantly the insect flies away. Alighting on some object, the May-fly then does something that is not known in any other insect. It again molts, a thin skin-like covering comes off of the entire body, even the wings. The insects—fragile and delicate—then fly about in the twilight, mate, the females lay their eggs, and all generally die in a few hours. Scarcely any live through the night. They are a favorite food of many fishes, and other insects prey upon them, yet with all this few insects are more abundant.



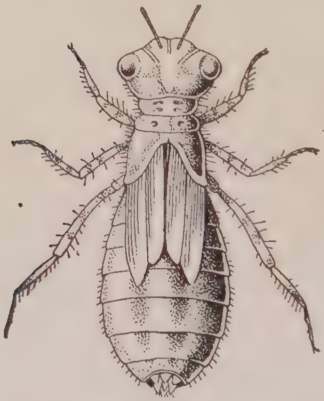
MAY–FLY

DRAGON-FLIES AND DAMSEL-FLIES

Order *Odonata*

WE now come to the Dragon-flies and Damsel-flies. The great number of common names applied to these insects would indicate that they have attracted attention for a long time. They are frequently called Devil's Darning-needles, and in some parts of the country it is believed that they sew up the eyes, ears, or mouths of bad little boys and girls, or at least children are told such stories. In the middle west, the names Snake-Doctor and Snake-Feeder are generally used. When I was a boy, I spent much time with my companions playing along the brooks and water courses. When we found Dragon-flies frequenting a spot, we tiptoed lightly about the place, not that we were afraid of them, but we wanted to see the snake that the insects were feeding! We were especially interested because we lived in a region where the poisonous copperhead was common. In Europe such names as Flying-adders and Horse-Stingers are given to these insects. I recently heard a group of boys refer to them as "airplanes." They are certainly the strongest fliers of all insects, and mechanics have suggested that their construction for flight be thoroughly studied for the modeling of airplanes.

The eggs of Dragon-flies are laid on the surface of the water, or on the leaves and stems of plants that have fallen into the water. The Damsel-flies place their eggs in the stems of aquatic plants just beneath the surface of the water. With the sharp, chisel-like ovipositor on the end of the body, they cut grooves in the stems of plants and place the eggs in these channels. It takes from a week to a month or even longer for the young to come from the eggs. They feed on small insects at first, but as they grow bigger, they look for larger game. They are even said to kill others of their own kind.



DRAGON-FLY NYMPH

The most interesting thing about the Dragon-fly Nymph is its mouth. The lower lip has developed into a long hinged instrument which folds over the lower part of the face like a mask. On the end of this implement are hooks or teeth for grasping its prey. With this mask folded over the face, the nymph has been described as looking like a bulldog, but let some insect approach near enough and the lower lip suddenly unfolds, its prey is caught and drawn into the mouth. Dragon-fly Nymphs may be obtained by raking out leaves, weeds, and mud from the bottom of shallow ponds. When found, the nymphs can be dropped in a glass fruit-jar filled with water. In fact, a large fruit-jar makes a good aquarium for studying water insects. The best time to get them is in April or May. I recently put some nymphs of our largest Dragon-flies in an aquarium with some tadpoles, five species of fresh-water fishes, and two small turtles. As the largest fish was scarcely four inches in length, they seemed to get along peacefully, and there was plenty of room for all. At first the nymphs spent most of the time on the sand and gravel at the bottom. Later they suspended themselves underneath the wooden float on which the turtles rested. They ate flies, and when such food could not be had they took little bits of meat. The greatest trouble was in keeping the fish from taking all the food. They swam rather rapidly, but with a jerky motion. The wing-pads grew larger, and finally the change was made to the mature insect.

The nymph looks nothing like the mature Dragon-fly, yet we say it has incomplete metamorphosis, because there is no period of rest or pupa stage in the insect's life. When the nymph is full grown, some fine morning it crawls up a stick or weed stalk, and after resting a while the skin splits down the back and the mature insect gradually pulls itself out, and when dry flies away to join its mates.

These insects, perfectly harmless to man, are the real dragons of the air. They sail back and forth and quickly grab up flies and mosquitoes. In some places boys call them Mosquito-hawks, a good name, and if they only worked at night, how valuable they would be! As I write these lines I see a large one flying about before my window going through many of the maneuvers of a skillful aviator. All their legs can be brought forward, forming a basket. Insects are caught in this basket, but are quickly transferred to the mouth.

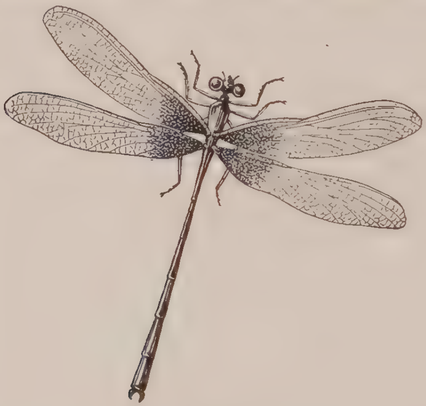
Capture a large Dragon-fly and fold its wings over its back. Hold it by its folded wings and feed it live house-flies. Beutenmüller found that a large one ate forty house-flies in less than two hours, and a smaller species ate twenty-five in the same time. When its tail is bent around and placed to its mouth, it begins to eat its own body. This shows that insects have very little or no sense of pain. The bodies of many Dragon-flies are very beautifully colored, and the eyes are large and brilliant.

There are three hundred species of Dragon-flies in the United States. More than a hundred different kinds have been described from New York State alone, and at least fifty different species have been found in the rather arid State of California. We have space to refer to only a few common forms.

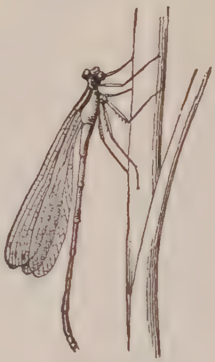
DAMSEL-FLIES

SUBORDER *Zygoptera*

To this group belong those Dragon-flies that fold their wings together over the back and parallel to the body. They are smaller, more slender, and not so voracious as the common Dragon-flies, hence are called DAMSEL-FLIES. They fly rather slowly, and generally just above the surface of the water. Their bodies are often a beautiful blue or green, and in some species the wings are very dark. They are most common along woodland brooks.



RUBY-SPOT



DAMSEL-FLY

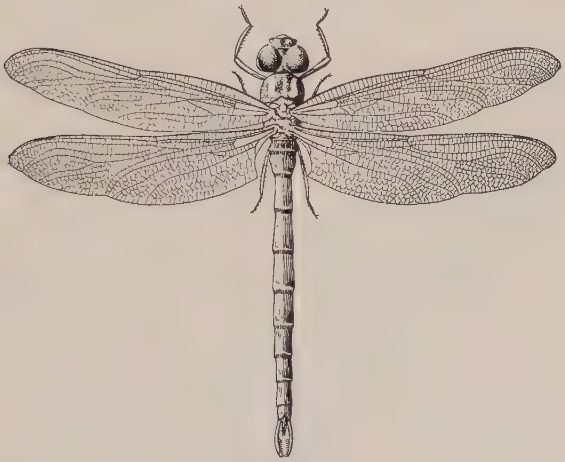
The RUBY-SPOT (*Hetærina americana*) is a common Damsel-fly. Kellogg says, "It is a perfect masterpiece of insect beauty and grace." The wings next to the body and for about one-fourth the length are blood red. The head and thorax are a coppery red and the abdomen is green. Only the male has the ruby spot. In the female the body is green and the base of the wings a yellowish brown. They are generally found in the latter part of the summer, and do not venture far from water courses.

DRAGON-FLIES

SUBORDER *Anisoptera*

THE true Dragon-flies vary greatly in appearance and habits. They all spread their wings horizontally when at rest. One of the best known is the COMMON MOSQUITO-HAWK (*Anak junius*). It is found all over the United States, Canada, and northeastern Asia, from spring until fall, from daylight to dark. The wings are clear and about two inches long. The head and thorax are bright green. This is one of the great enemies of the mosquito.

A still larger member of the family is called the Hero (*Epiæschna heros*). It is the largest of all our Dragon-flies. I have a mounted specimen before me as I write. Its body is three and a quarter inches long, and it measures five inches across the wings. In general appearance it is like the species just described, only larger. These insects sometimes find their way into our houses. Three were given to me in one day that had flown into an open window of a schoolroom.



DRAGON-FLY

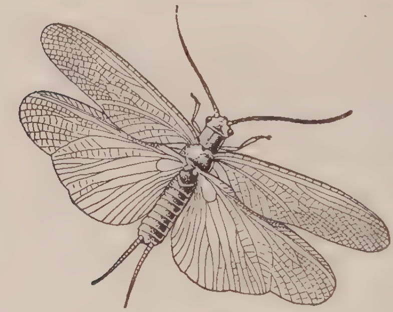
Dragon-flies of another group are called "Skimmers." They can fly swiftly, but are often seen hovering over pools. Many of them have the wings marked with white, black, or brown blotches. The abdomen is frequently covered with a whitish powder. One of the best known is the "Ten-spot" Skimmer. It has three blackish-brown blotches on each wing. Between these blotches, on the male, is a spot of white. It is a pond-loving species, and may often be seen resting on weeds or sticks. It may have been this species that James Whitcomb Riley had in mind when he wrote—

> "And the ghostly Dragon-fly pauses in his travel
> To rest like a blossom where the water-lily died."

STONE-FLIES

ORDER *Plecoptera*

ALMOST every boy who has fished much in the brooks and creeks knows the nymphs of the STONE-FLY, although he probably did not know what to name them. When we turn over stones, especially where the water is running rapidly, we are apt to find the young of these insects, from half an inch to an inch long or more, and clinging tightly to the stones. Comstock says: "They cling so closely and are so nearly the color of the stone that they look almost like fossils." They prey upon the young of May-flies and other insects. We must not forget that they too are also preyed upon. They are the favorite food of many kinds of fish, especially of the brook trout. In some parts of the country, the adults are called SALMON-FLIES.


STONE-FLY

The mature insect is greenish-gray in color. The fore-wings are finely veined and are rather slender. The hind-wings are larger and plaited, that is, partly folded like a fan. When at rest, both wings are folded backward over the body. Stone-flies are frequently seen flying just above streams. The female lays from five thousand to six thousand eggs. The empty nymph shells are common objects along the banks of streams, or found clinging to stones or bowlders in the brooks.

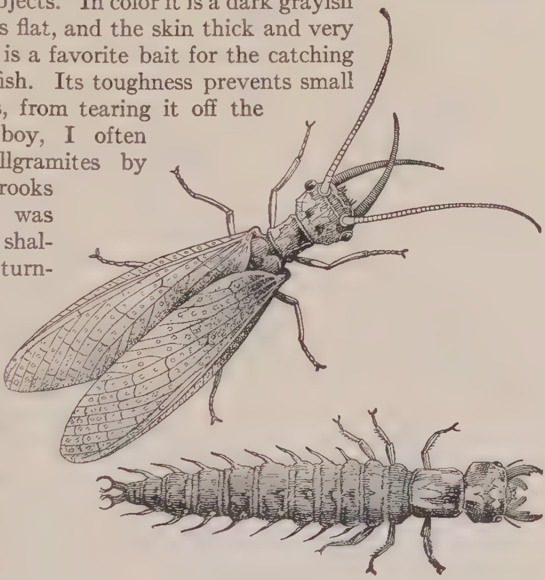
NERVE-WINGED INSECTS

ORDER *Neuroptera*

THE insects of this order have four wings, with numerous veins and cross-veins and are sometimes referred to as lace-wings. The mouth is for biting, and the head does not end in a beak. Metamorphosis is complete.

The HORNED CORYDALIS, DOBSON CRAWLER, or HELLGRAMITE (*Corydalis cornuta*), is one of the most striking and interesting of all our insects. Most people do not associate the complete insect with the larva. In the little state of Rhode Island, one authority found sixteen different common names in use for this creature. The name Hellgramite was not among those sixteen, and yet it is the one that I have found most generally used.

The egg masses, chalky-white blotches in appearance, are placed against stones, rocks, or on leaves of overhanging bushes. They are often so numerous along rocky streams as to be conspicuous. When the young hatch they fall into the water and remain there for nearly three years. They are found most numerous where the brooks run shallow but swift. They feed on the nymphs of Stone-flies and other aquatic insects. When full grown the larva is at least three inches long. The head has two strong biting jaws, and the tail has two hooks for attaching to stones or other objects. In color it is a dark grayish brown. The body is flat, and the skin thick and very tough. The larva is a favorite bait for the catching of bass and other fish. Its toughness prevents small fish, such as chubs, from tearing it off the hook. When a boy, I often caught many Hellgramites by wading into the brooks where the water was flowing swiftly over shallow places, and on turning over stones picked them from the pebbly bottom or grabbed them as they floated down the stream. We had to be careful, for the jaws were capable of giving a hard pinch. Yet we had a neighbor, a famous fisherman, who always carried his Hellgramites in his hat on his head, in order to have them handy! When he wanted one for bait, he stooped forward, bent his head low, took off his hat, took a crawler from it, and put his hat back on his head. Often in wading streams he had an advantage but sometimes we heard strange mutterings that indicated that it was not always peaceful beneath his hat.



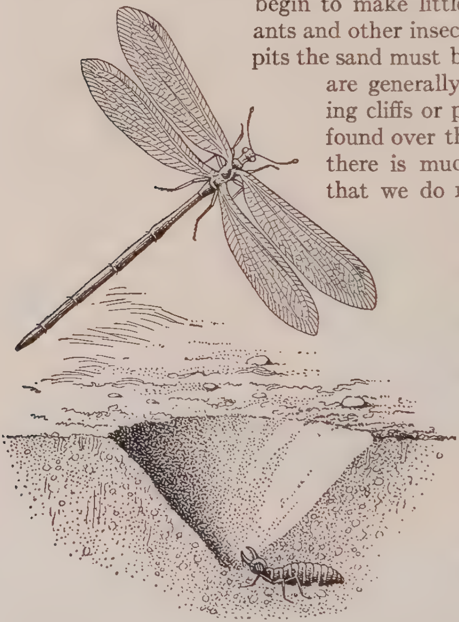
HELLGRAMITE

When fully grown the larva crawls out of the water but generally does not go far from the stream. It buries itself beneath stones, logs, or other material to pupate. A month later it comes out a vicious looking insect, with four wings that measure more than three inches across when spread. The male has great piercing jaws that measure an inch long and cross each other when at rest. However, they are not used for pinching. The female has short, stout jaws that can pinch. The winged insect is often called DOBSON-FLY, and is sometimes found about street lamps.

ANT-LIONS

ORDER *Myrmeleonidæ*

THESE most interesting insects are best known in the larva state. The eggs are laid in the sand, and when hatched the larvæ at once begin to make little pitfalls for the capture of ants and other insects. In order to make these pits the sand must be very fine and dry. They are generally observed under overhanging cliffs or projecting rocks. They are found over the entire United States, yet there is much about their life history that we do not know. When I was a boy, I often visited a large ledge of rocks against a wooded hillside. Two hundred feet below flowed a large creek where the swimming was fine and the fishing good. But I often got no farther than the rocks, for beneath this projecting ledge were thousands of the conical pits of Ant-lions. Some of these were tiny, and others were three inches across. At the bottom of each pit, an Ant-lion was buried up to his jaws. Throw an ant in a pit and it was quickly seized and killed, yet the larva was often no larger than the ant itself. An ant is generally a good fighter, but the Ant-lion's great sharp hooked jaws are too much for him. If the ant does not reach the bottom and tries to get out of the pitfall, the "lion" showers him with



ANT-LION

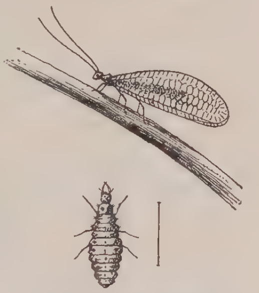
sand and he falls back again. I tried to find out how the Ant-lion dug his pit, but could find none at work. Taking my hand I leveled up a space, destroying a number of pits. A few of the Ant-lions jumped and wiggled about in the sand, but none went to work; yet the next day I found new pits neatly made, so I am convinced that they generally work at night. He makes his pit by going round and round, always working toward a center and tossing the sand out with his head. By taking a shallow box a foot square or larger and filling it two inches deep with fine dry sand and placing a few Ant-lions in it, a person can keep these insects for quite a while. By this means, I kept a number of them for several months, occasionally feeding them house-flies and ants.

They form a round pupa, covered with sand, and held together with silk. The mature insect resembles a small Dragon-fly. It is not often seen in the East, but is common enough in the Southwest.

LACE-WINGED FLIES, OR APHIS-LIONS

FAMILY *Chrysopidæ*

VERY greedy indeed are the APHIS-LIONS, so much so that the mother, the LACE-WING FLY, knows that should she lay her eggs in mass on the leaf, the first one hatched would devour the others. She guards against this by placing each egg on the top of a stiff silk stalk about half an inch high. So when the first egg is hatched, the larva crawls down the stalk and away in search of food, leaving the others unmolested. The larva, from his habits of devouring the *Aphis* and other plant lice, is called the Aphis-lion. He has a pair of long, pointed jaws, grooved on the inner surface. After capturing a plant-louse, he pierces its body with his sharp jaws and holds his head up, letting the blood run down into his throat. You can imagine how many lice and other injurious insects these bloodthirsty lions dispose of and how valuable they are as protectors of plants.


APHIS-LION AND LACE-WING

After about ten days of feasting, the larva is full grown and rolls itself up in a ball, spinning a round silken cocoon that looks like a pearl.

One can scarcely imagine that the beautiful Lace-wing Fly that comes out of the cocoon about two weeks later could have been the greedy Aphis-lion. It is one of the most beautiful insects we find. The wings are green, delicate, lace-like, and the eyes are golden. From its appearance it gets the name of Lace-wing, or Golden-eyed Fly. But beware of touching it, for it emits a most disagreeable odor. This undoubtedly is its only protection. If you crush one of these delicate flies, the odor is so lasting that it is difficult to wash off, even with soap and water. The Lace-wing Fly is found all over the United States.

GRASSHOPPERS, CRICKETS, COCKROACHES, ETC.

ORDER *Orthoptera* (Straight-wing)

TO this group belong GRASSHOPPERS, CRICKETS, COCKROACHES, WALKING-STICKS, and the MANTIS. The members have incomplete metamorphosis, four wings, and mouth parts for biting.

The species belonging to this group are numerous, and some of them are among the largest insects known. With the exception of the Cicadas, nearly all the insect musicians belong to this order. All through the summer and early autumn their strident sounds may be heard, especially in the evening.

The fore-wings of these insects are narrower and made of firmer material than the hind-wings, and they serve as covers instead of organs of flight. The hind-wings are folded fan-like and are protected by the front-wings. The name *Orthoptera* comes from two Greek words meaning straight wing, and refers to the long straight folds in the back wing.

ROACHES

FAMILY *Blattidæ*

THESE are flat-bodied insects that run rapidly and love darkness. They are very abundant in the tropics, and many species migrate with ease. Our native American species are harmless creatures that live under bark and boards. On the Atlantic coast we have a European species that has become very troublesome in houses. It feeds on pastry and vegetable matter. About New York it is called CROTON BUG, because it became abundant about the time that the Croton water system was introduced in New York City An Australian species is common on the Pacific coast and in the South. Tropical species are often very large

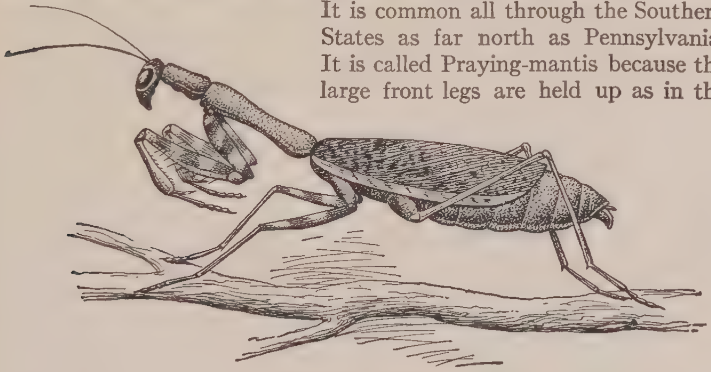
COCKROACH

Friends of mine, while traveling in Cuba, were on one occasion greatly annoyed by mice in their sleeping room in one of the best hotels of that island. After retiring, these creatures came forth and made so much noise in running and rustling over the floor, that my friends had trouble in going to sleep. The next day they bought a circular mouse-trap with five holes, with wire springs for grasping the mouse around the neck. That evening they baited the trap and set it. They had scarcely retired before one of the springs went off with a snap. In a short time all the others were thrown in turn. My friends got up to remove the mice and re-set the trap, but on turning on the light they were greatly surprised to see that they had caught five cockroaches, each nearly as long as a finger.

PRAYING-MANTIS

FAMILY *Mantidæ*

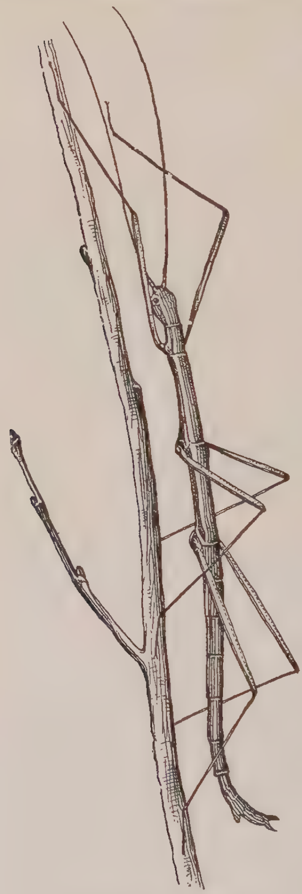
THE names PRAYING-MANTIS, SOOTH-SAYERS, REARHORSES, MULE-KILLERS, and others have been applied to this most interesting insect. It is common all through the Southern States as far north as Pennsylvania. It is called Praying-mantis because the large front legs are held up as in the attitude of prayer. He is not praying, however. The heavy front legs which end in hooks are held ready to grasp any insect that comes near enough. In the South he is called Mule-killer, because the dark colored saliva is supposed to poison mules. He is not poisonous in any way, and is of real value in destroying other insects. He is said to be the only insect that can turn his head around and look over his shoulders. The male is brownish and the female green.



PRAYING MANTIS

The European Mantis has been accidentally introduced in central New York, and it will be a good thing if it continues to spread. The large Chinese Mantis has been introduced near Philadelphia and elsewhere. It is green and brown in color, and attains a length of at least three and one-half inches. I kept one of these for some time by feeding it house-flies and other insects.

In speaking of the Mantis, Howard says: "Like so many other predatory insects, they have the most voracious appetities. Colic and bilious headaches seem unknown to them." One Mantis ate three grasshoppers, each seven-eighths of an inch long, a daddy-long-legs, and then tackled another Mantis.



WALKING-STICK

WALKING-STICKS

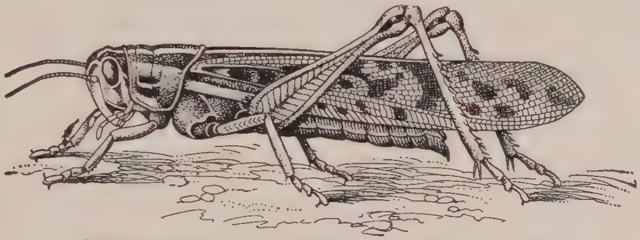
Family *Phasmidæ*

Rarely a summer passes but that someone comes to me to find out the name of that curious, odd-looking creature with long legs and slender stick-like body. This strange insect lives among the trees, eating the green leaves. They are generally not numerous enough to do any harm. The eggs are dropped from the trees to the ground, where they remain all through the winter until the next May before they develop. It is said that in some cases the egg stage occupies two winters. The young develop rapidly, and in two or three months are full grown. They are wonderfully well protected, both in form and color. They not only resemble twigs, but during the early part of summer they are green, but gradually change to brown just as the green twigs change. Even the eggs closely resemble seeds in color and appearance. The common Walking-stick is found all over eastern United States, but similar species are found in the West and Southwest. Those found in this country have no wings, but some tropical species have wings that resemble leaves.

LOCUSTS, OR SHORT-HORNED GRASSHOPPERS

FAMILY *Acrididæ*

NEARLY every boy is familiar with GRASSHOPPERS, for on almost any summer day as we walk along the roadside or through the fields, they jump or fly before us. The mother Grasshopper bores a hole in the ground with her ovipositor. In this hole, which is nearly an inch deep, she deposits about thirty eggs. These remain there all winter, and in the spring hatch into tiny Grasshoppers, with big heads, short bodies, and long legs. At first the young has no wings, but with each molt its body develops, and finally tiny wings appear. They are of no account at first, but with each change of skin they grow larger, and by midsummer it is a complete insect, and can fly about and enjoy the sunshine.



SHORT-HORNED GRASSHOPPER OR TRUE LOCUST

When a Grasshopper flies before us, we can see its yellow and black under-wings. These are large, and fold up like a fan. We cannot see the under-wings when the insect is at rest, for the upper ones completely cover them.

Grasshoppers make two sounds. One is a harsh, crackling sound, made in flight by rubbing the upper surface of the front edge of the hind-wing against the under surface of the fore-wing. There is a sun-loving species that lives about the bare rocks on some of the peaks of the Catskill Mountains, which makes a much louder sound by this method than that made by any others I am aware of. Some Grasshoppers rub the hind legs, which contain minute spines, across the outer surface of the upper wings, They produce this sound when at rest. The wing cover acts as a fiddle and the hind leg as a bow.

There are many species of Grasshoppers found all over the United States. One of the best known is the ROCKY MOUNTAIN or MIGRATORY LOCUST. Its real or breeding home is on the plains and plateaus of Colorado, Wyoming, Montana, and Idaho. In the early days before grain was planted in those States, food was often scarce and these hoppers then migrated to the grain fields of the great plains and the Mississippi Valley. Rising high in air and spreading their wings to the strong breeze they sailed to the east, often traveling for a thousand miles. Settling down on the farms of Kansas and Nebraska, even as far east as middle Iowa and Missouri, they ate almost every green thing in sight. From 1874 to 1876 more than $200,000,000 worth of crops were destroyed. The Government appointed a special commission to investigate them. It is not likely that there will ever again be such a scourge of locusts in this country, for there is now more food in the Rocky Mountain States, and men are also learning how to partially control them.

The RED-LEGGED LOCUST (*Melanoplus femur-rubrum*) is quite like the Rocky Mountain species, but it has shorter wings. It is perhaps our most common Grasshopper, and is found over the greater part of the United States.

THE CAROLINA LOCUST (*Dissosteira carolina*) is common throughout the United States and Canada. Its color varies, but is generally a light brown. This is the large Grasshopper that we so often see along the public highways. As you walk along it flies up before you to drop down again in the sunny road a few rods away. It matches the color of the ground so well that it is almost impossible to see it until it rises again near your feet. It seems to like the dusty roads.

LONG-HORNED GRASSHOPPERS

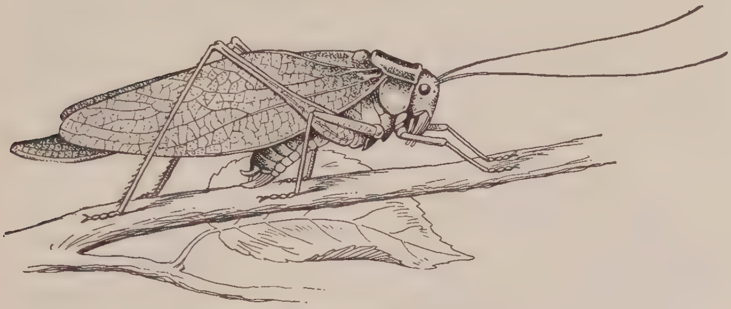
FAMILY *Locustidæ*

NEARLY every boy is familiar with the slender green Grasshoppers found in the tall grass of the meadows. Their antennæ or horns are longer than the body, and are so slender as to be hair-like. The general name of MEADOW-GRASSHOPPER is applied to this group. They are great singers. The sound is made by the males rubbing their wing covers together. They have a day song and a night song. The day song is sung, or perhaps I should say fiddled, in the bright sunshine. On one occasion Scudder was watching one of these insects sing when a cloud passed over the sun. It immediately began to sing its night song, but when the cloud passed away it resumed its day song.

THE KATYDID is perhaps the best known of the long-horned Grasshoppers. And it is better known by song than by appearance. I have read somewhere that it probably makes a louder noise for its size than that made by any other creature. On a calm night it may be heard for more than a quarter of a mile. This sound is made by rubbing the two outer wings together. They sing only in the evening and at night. Just what Katy did or did not do, no one will ever know. Only the male

Katydids sing. The females are silent. Oliver Wendell Holmes was mistaken when he wrote:

> "Thou art a female Katydid!
> I know it by the trill
> That quivers through thy piercing notes,
> So petulant and shrill."



ANGULAR-WINGED KATYDID

Katydids live in trees. Perhaps that is the reason why we do not see them more often. If you do happen to come across one during the day, you will see a large green Grasshopper with long silky feelers, green eyes, and leaf-like wings. Perhaps you will also see him lift one of his hind legs and rub his feelers across it. After watching one do this several times, I concluded he was trying to keep himself neat and clean. If the female cannot sing she at least has ears. The organs of hearing of long-horned Grasshoppers are found on their front legs.

There are several species of Katydids found over the United States, but there is not much difference in their general appearance. The eggs are laid in rows on the twigs and are not developed until the next spring.

CRICKETS

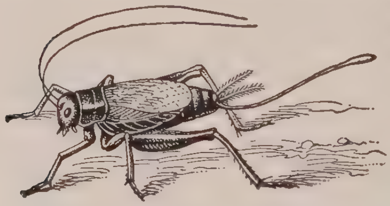
Family *Gryllidæ*

These insects resemble Grasshoppers in having large hind legs, and in their ability to leap, but their wings are flat on the top and bend sharply down the side like a box cover. They live under stones, or deep in the grass, and have holes or retreats in the ground where the eggs are deposited. When the weather is cool in autumn, some species get into the house and sing where it is warm and pleasant. This habit is especially true of the European House Cricket, which has been introduced in some places in this country. Some people believe that when this Cricket gets into the house it is a good omen.

Crickets are said to be the most musical of all insects. Again it is only the males that do the singing, or fiddling, I had better say, but the females have been seen to stand near and probably listen and perhaps admire. A heavy vein on the upper wings has a roughened surface that acts as a file. On the under side of the top wings is a kind of scraper. When the Cricket wishes to fiddle he elevates the wings and then rubs the scraper over the file, giving a high pitched sound. The rate of chirp depends upon the temperature. The Snowy Tree Cricket, a greenish white species living in trees and shrubs, sings a very common night song. The rapidity of its chirps is so affected by heat and cold that a formula has been devised for getting the temperature. This formula reads:

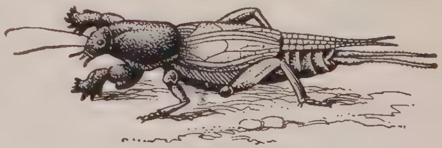
$$T = 50 + \frac{N - 40}{4}$$

T stands for temperature in degrees Fahrenheit, and N the number of chirps per minute. For example, if the number of chirps a minute were 112, then the temperature would be 68°. I have also found that this formula works with the Common Field Cricket. With the assistance of a friend I once tested this and found that with several Crickets at different times during the evening, the calculated temperature varied less than two degrees from that shown by the thermometer.



COMMON FIELD CRICKET

The Mole-cricket looks but little like the true Cricket. It is much larger, and has heavy front legs with mole-like feet for digging. As it does not jump, the hind legs are not large. It chirps quite loud and sharp. It feeds on tender roots of plants. When I was a boy, I often dug for earthworms, for fish-bait, along a brook where the ground was damp. Frequently I dug out these queer looking Mole-crickets an inch and a half long. I was afraid of them at first, but later learned that they were harmless.



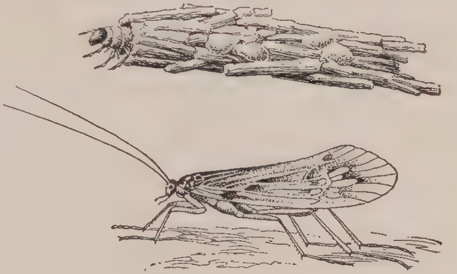
MOLE-CRICKET

In Porto Rico there is a Mole-cricket that destroys the tobacco, sugar cane, and other crops. It is by far the most serious insect pest on the island.

CADDIS-FLIES

Order *Trichoptera*

What curious creatures are these that we see crawling along in the brook or stream? A head and front legs protrude from an odd-looking case. On closer observation we see that it is a worm or larva with a case built around it. This is the Caddis-worm, and his peculiar home is built of various materials, each species using a different kind. Sometimes they are masons building of small pebbles or sand. Other species are carpenters using tiny sticks or bits of wood which are laid together like the building of a log cabin. These are bound together with a silken thread which the worm spins.



CADDIS FLY AND WORM

When ready to pupate, it crawls into its house, which it fixes to some convenient rock or pebble, and closes the opening, allowing space for the water to enter, for it breathes the air dissolved in the water as the fish do. When it emerges, we have the Caddis-fly, a moth-like insect, with four wings and two long antennæ. It is often attracted by porch-lights and is mistaken for a moth. When in repose, its wings are held in a vertical position against the body. The eggs are deposited near the water and hatch into the Caddis-worm, which is aquatic and at once covers its body with a silken case to which it attaches its artificial shell, already described.

There is another species of Caddis-worn, not so well known, called the Net-making Caddis-worn. Its habits are somewhat different, as it builds its home of tiny pebbles which it fastens to a rock. It then goes forth in search of food. To catch his prey he weaves a silken net which is always placed in swiftly flowing streams. It is usually funnel-shaped, opening up-stream. This catches small insects, for the Net-building Caddis-fly is carnivorous. If you turn over stones in almost any brook in the country you are apt to see them.

ORDINARY BUGS

Order *Hemiptera* (Half-wing)

INSECTS of this order have four wings, mouth parts are formed for sucking, and the metamorphosis is incomplete. They vary much in size and appearance. Some of the smallest and some of the largest insects belong here. A few are beneficial and others are very injurious. The Cochineal and Lac-insects furnish valuable products.

To this order belong the true Bugs. It is from these that we get the name Hemiptera, meaning half-wing, for they have the first half of the wing hardened and the remainder or back part membranous. In the Cicadas, all four wings are membranous and slope to both sides like a roof. Some of the scale-insects and plant-lice are without wings. Here, also, belong such pests as the lice and bed-bugs—degenerates that have lost their wings.

CICADAS

FAMILY *Cicadidæ*

THESE insects are large and conspicuous, and should be familiar to every boy. Many people are afraid that they have a poisonous sting, but they are entirely harmless and may be handled without fear, for they can do no bodily injury whatever.

Of all our singing insects, to my mind these are the most musical. It is only the males that sing. This fact was known to the ancients, for one of their poets said:

> "Happy are the Cicadas' lives
> Because they all have voiceless wives."

DOG-DAY HARVEST FLY

On each side at the base of the abdomen, in the male, is a membrane attached to muscles within. This membrane vibrates, producing the sound. It is one of the loudest noises or sounds made by any insect.

The common DOG-DAY HARVEST FLY, or LYREMAN as it is sometimes called, is a very familiar insect during the warm days of July and August. Its piercing, rhythmic sound may be heard in the trees from morning until night. Sometimes it settles on a low branch or weed where we can watch it sing. Its whole body seems to vibrate in the operation. This insect is colored black and green and is about two inches long from head to tip of closed wing. It is believed to take two years in its development, but its life-history has apparently not been well worked out. It may be longer.

The PERIODICAL CICADA, or SEVENTEEN-YEAR LOCUST as it is often erroneously called, is one of the most remarkable insects in the entire country. So far as we are aware, there is not another insect that requires more than five or six years to complete its development, while in the case of the Periodical Cicada it lacks only two or three weeks of being seventeen full years, except that in the southern part of the United States it is a thirteen-year "locust."

With her ovipositor, the female cuts slits in twigs of various trees and the eggs are placed in these tiny cracks. In a month or six weeks the young hatch and drop to the ground, where they burrow beneath the surface. The larva (perhaps nymph would be a better word) feeds on the humus of the soil and the tender roots of plants and trees. For seventeen years in the North and thirteen years in the South these insects live beneath the surface of the ground. In May of the seventeenth year they come up to near the surface. If they are in low or wet ground they sometimes build a turret above the surface of the soil. Some night in June, or late May, they come out of the ground, crawl to a tree or other object, and after climbing up some little distance, the hooks on the feet are firmly fixed. Then the shells split down the back and the insects crawl out. They are delicate and light in color at first. Only tiny wing pads show, but blood is pumped into them and they quickly expand and harden.

SEVENTEEN-YEAR LOCUST

The mature insect is less than an inch and a half long. It is dark in color with red eyes and red wing-veins. It is almost impossible to tell how numerous these insects are. I once undertook to count the holes, under a small tree, made by the insects coming out of the ground. They averaged about thirty to the square foot, or at least three thousand on a space ten feet square. Dr. Henry C. McCook records that under a beech tree which spread over a circle thirty feet in diameter, the earth was pierced with 31,500 burrow-holes. Where they are very abundant, the woods fairly ring with their music. They can sing two different songs. The most common one is a long-drawn-out "Far-r-r-r-o-o-o-o." The other song is more of a buzzing sound and higher pitched. In studying one of the large broods, I always found them singing the regular song, and it was not until the insects began to wane that I came to a wooded hillside, surrounded by fields, where the Cicadas were all singing the entirely different but high-pitched song.

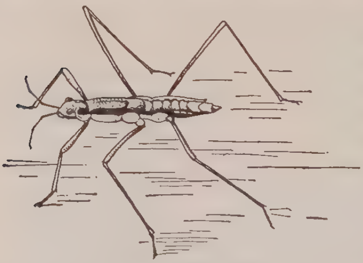
There are many large broods of seventeen-year Cicadas. Some of these broods cover the greater part of several States. I helped to map two broods in Pennsylvania. The one occurred in 1897 and in 1914, the other in 1900 and in 1917. Taking a bicycle, I followed the roadways leading along the edge of the brood. Often the insects were especially abundant on the very edge of the region covered by them. Frequently on the one hand the woods fairly roared with their singing, and on the other it was silent. Sometimes I would get out of hearing of the insects and would return. In this way I followed them for many miles across two counties. Of course, the two broods had very different boundaries.

Many species of birds feast on the Cicadas. I also found that along a river where they were especially abundant, the black bass were satisfied.

WATER-STRIDERS, OR WATER-SKATERS

FAMILY HYDROBATIDÆ (*Gerridæ* of some authors)

WE often see on the unruffled surface of pools in brooks and small streams, insects that resemble spiders running or gliding over the top of the water. The body is narrow and the legs long. All spiders have eight legs, the WATER-STRIDERS have six, and of course are true insects. The front legs are not used for running, but are held up so that it can grab any insects that may be found on the surface of the water. They move so rapidly that it is difficult to determine their motion, but it seems to be gliding rather than running. The middle pair of legs propels the insect forward and the last pair is used for steering.



WATER-STRIDER

When a boy, I was greatly interested in these insects, and often creeping up to a pool we sometimes saw several of them gliding around one another and moving back and forth over the surface of the water. They reminded us so much of a group of boys skating on the ice that we called them WATER-SKATERS, a name that I often hear applied to them by boys. I am sorry to say that we sometimes threw stones at them, but they usually glided out of harm's way. They are useful insects, and feed especially on the larvæ of mosquitoes.

It always seems a puzzle just how they can run over the surface of pools without sinking in. Their body is very light and is covered with fine plush-like hairs that repel moisture. Their feet dimple the water, but do not break through the surface-film.

In autumn they bury themselves in the mud at the bottom of pools, or hibernate under stones in the water, coming out again in the springtime to lay their eggs, which are attached to the leaves and stems of water plants. They can be kept in an aquarium if the water is low enough so that they cannot jump out. In taking them from the pool to the aquarium, it is best not to carry them in water, but to use a dry box. Be careful in handling them, for they can puncture the skin with their sharp beak.

In tropical regions there are Water-striders on the surface of the ocean, hundreds of miles at sea. It is claimed that they feed on the juices of dead animals that float on the surface of the water.

WATER-BOATMEN

Family *Corisidæ*

These are small bugs, not more than half an inch long and generally much less. They are boat-shaped, flat on the back, and are finely mottled, gray and black. The insects swim with the back up. Their hind legs are long, flattened, and fringed with hair so that they can use them as paddles to propel them through the water.

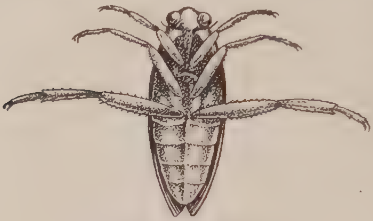
These insects are found in streams, ponds, or lakes all over the United States. They are generally seen beneath the surface of the water, but come up occasionally to get air. Their body is so clothed with a velvet-like nap that the air clings to them and they take bubbles down with them. This enables them to stay under water for a long time. By waving their legs, they bring fresh water to the air, thus purifying it, and they do not need to come to the surface often. They can jump from the surface of the water and take wing, and are sometimes found about street lamps. They feed on small aquatic insects. The eggs are fastened to the stems of water plants. The adult insects spend the winter in the mud, where they lie dormant until spring.

WATER-BOATMAN

BACK-SWIMMERS

Family *Notonectidæ*

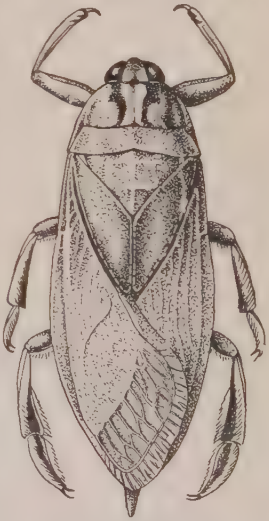
These insects in size and appearance are much like the Water-boatmen, and are found in similar situations. In color they are generally bluish black, marked with white. The backs of these insects are keeled and shaped like the bottom of a boat. When they swim, they always go with the back down. In this respect they differ from all other water-bugs. They are often seen lying on their backs on the surface of the water, projecting far enough to admit air to their breathing tubes. Both Water-boatmen and BACK-SWIMMERS can be kept in an aquarium, but we must be very careful in handling them, for with their sharp, strong beaks they can inflict severe and painful stings.


BACK-SWIMMER

GIANT WATER-BUGS

FAMILY *Belostomatidæ*

SOMETIMES we find crawling about on the bottom of ponds, a giant Water-bug about 2¾ inches long and more than an inch wide. We more often see them in the latter part of the summer, flying about electric lights or crawling on the ground beneath them. They are the largest of all the bugs, and not only feed on other insects but are capable of capturing small fish and tadpoles. The first Water-bug of this kind that I ever saw was when I was a boy, hunting for Hellgramites in a brook, and on turning over a stone found one of these insects beneath it. I picked it up in my hand and found that it had a powerful beak by which it produced a painful puncture. It is said to inject saliva into the wound, but in my case the finger did not swell. However, when small fish or water insects are caught, paralysis soon follows the bite. The Giant bug sucks the blood or juices of the victim. The front legs are well adapted to grasping its prey, and the hind legs are wide and flattened for swimming. There are two large species of these insects, both called GIANT WATER-BUG, or ELECTRIC-LIGHT BUG. The one is called by scientists *Belostoma americanum.* It has a deep groove on the under


GIANT WATER-BUG

side of the thighs of the first pair of legs. The femur or second section of the leg bends over and fits into this groove. The scientific name of the other large Water-bug is *Benacus griseus*. It resembles the first in appearance, but does not have grooves in the front legs.

On the Pacific slope, there is a similar Water-bug, only smaller, that is known as the TOE-BITER. It is a common insect of the streams of that section. Its scientific name is *Serphus dilatatus*. This species and others quite like it in the East and South have the curious habit of gluing the eggs on the backs of the males. For a long time it was supposed that the females placed the eggs on her own back for protection. But somebody noticed that she had no means of placing the eggs on her own back. A careful observer placed some of these insects in an aquarium and found that the female placed the eggs on the back of the unwilling male. Howard says: "Sometimes she has to struggle for hours to accomplish her fell purpose, but she does accomplish it in the end and her spouse is converted into an animated baby carriage." Their life-history has not been well worked out.

PIRATE-BUGS, OR ASSASSIN-BUGS

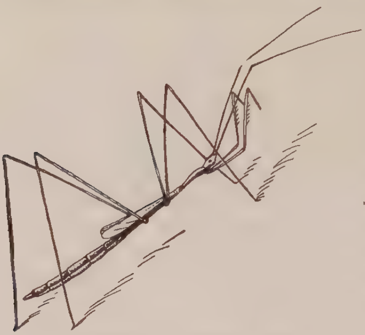
FAMILY *Reduviidæ*

THE ASSASSIN-BUGS not only feed on other insects, but some of them take blood of higher animals. Their bite is severe and poisonous, often causing intense pain and swelling. There is one in the South and West that attacks human beings. It is black, marked with red, and is known as the BIG BED-BUG. A similar species is known as the BED-BUG HUNTER, from its habit of going into houses and searching for insects.

ASSASSIN-BUG
(Kissing-Bug)

A few years ago there were many newspaper accounts of people being bitten by "kissing-bugs." Some of these accounts were true, for these insects inflict painful wounds. Saliva is injected into the wound, which normally serves to paralyze the insects captured. The so-called kissing-bugs refer to the two species mentioned above, along with one or two others of this family.

Here also belong the THREAD-LEGGED BUGS. These are very slender creatures, about an inch and a half long, with legs much longer. They are grayish-brown in color, with a reddish tinge above. Their long legs are so slender that they look almost like threads. They are very common in the middle West, and are generally found on the under side of roofs of sheds and barns. The most common species of Thread-legged Bug is *Emesa longipes*. With all their long legs, they move very slowly, and expect to capture insects that cannot get away from them. They appear very stilted, and generally move about with the back down. One kind is said to frequent spiders' webs and rob the spiders of their prey. I have seen two or three dozen of them clustered among the grapevines and all moving up and down as though dancing to some strange music. I am not quite certain now whether this dancing motion is in unison or not. Their front legs, though slender, are fitted for grasping insects, reminding one of the Praying-mantis.

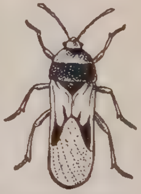

THREAD-LEGGED FLY

The true Bugs form a very large group. The species often vary but little, and we can mention only a few of them.

CHINCH-BUGS, ETC.

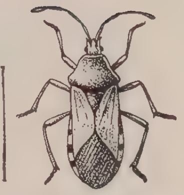
Family *Lygæidæ*

The Chinch-bug is a very tiny insect, yet it causes, according to good authority, a $20,000,000 loss to crops in this country every year. It is most common in the great corn regions of the Mississippi Valley, although found nearly all over the United States. This bug is scarcely more than a sixth of an inch long. It is dark with white wing-covers and a black spot on each wing. The mature insects live over winter. The eggs are deposited on the roots of plants, generally wheat, early in the spring. They soon hatch, and the young mature in about six weeks. They then march away to find new pastures, where a second brood is raised. Although they have wings, yet in migrating they generally travel on foot. They are the worst enemy of the corn, and sometimes great fields are destroyed in less than a week. They are so abundant at times that they almost cover the surface of the leaves and stalks of corn. Various methods have been used to control this insect, but none has been very successful. In late years a parasitic fungus attacks them, and, if the weather is favorable, kills them by the wholesale.


CHINCH-BUG

SQUASH-BUG, ETC.

FAMILY *Coreidæ*



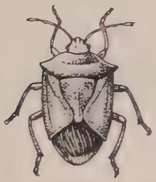
SQUASH-BUG

THE SQUASH-BUG is probably the best representative of this family. These are dark-brown bugs with yellow spots along the abdomen. The adult insects hibernate and lay their eggs in the springtime on the tender plants of squashes and pumpkins. The young hatch in about two weeks, and suck the sap of the young plant. If the plants can be protected until the vines grow long, these insects can do but little damage.

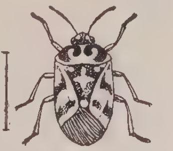
STINK-BUGS

FAMILY *Pentatomidæ*

EVERY boy who has gathered blackberries and strawberries knows the STINK-BUGS. They know them by taste and smell, if not by sight. Some are greenish, others brown, and a few are black and red. They have a very disagreeable odor and a biting, pungent taste. They are often found on blackberries, and in eating this fruit from the stalk one is apt to get them in his mouth.



STINK-BUG



HARLEQUIN CABBAGE-BUG

In the South and West there is a very troublesome insect belonging to this family. It is called the HARLEQUIN CABBAGE-BUG, or CALICO-BACK. It is black, with red or orange stripes and spots, and is not quite half an inch long. This bug is a native of Central America, and has covered all of this country except the northern part. It feeds on cabbage, turnips, radishes, and other garden vegetables. In the market gardens of California it often does much damage.

SPITTLE-INSECTS

FAMILY *Cercopidæ*

I AM sometimes asked by boys about the frothy masses that we occasionally see on weeds, especially in woodlands, and on low grounds. If we examine these frothy masses, we find within them the young of the

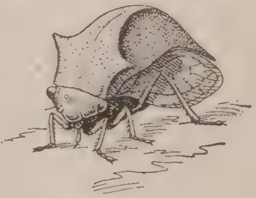
Spittle-insect or Frog-hopper. It gets the latter name from the fact that it somewhat resembles a frog and can hop. A liquid is exuded from the body, and when the latter is moved about it churns it into a spittle-like mass. Just what use this froth is to the insect is not known, perhaps only to hide it.

SPITTLE-INSECT

TREE-HOPPERS

Family *Membracidæ*

As I looked at a funny little Tree-hopper on a crab-apple tree, I thought of Comstock's words: "Nature must have been in a joking mood when Tree-hoppers were developed." They are certainly droll-looking little creatures. Their eyes are bright and far apart, and have the appearance of wearing glasses. The pro-thorax, or that portion of the body just back of the head, is often prolonged to cover the whole body. Sometimes it forms horns, a peaked hat or other odd shape, but if you notice how difficult it is to find these little brownies of the insect world, you will see that their peculiar forms afford fine protection. They feed upon plants, but are not abundant enough to cause any harm, except that some species lay their eggs in a groove made in a twig and this seems to prevent the growth of the twig. They all hop and fly; hence the name Tree-hopper.



TREE-HOPPER

PLANT-LICE

Family *Aphididæ*

These insects are very numerous both as to individuals and species. They are green or brownish in color, and the very largest are not more than a quarter of an inch long. They are generally much smaller. They feed on the tender parts of many plants, and are among our most troublesome insects. They reproduce so rapidly that nearly all vegetation would be eaten up if they did not have so many natural enemies. It has been carefully calculated that, in some species, if all the individuals descended from a single Aphid should live through the season, they would, if placed end to end, form a line several million miles in length.

Most Plant-lice are pear shaped, with rather long legs, and in some cases with two pairs of gauzy wings. (The great majority are without wings.) Usually in the same species there are both winged and wingless forms. Near the tail-end of the body are two horn-like projections. From these, and from the tail of the Aphis itself, drops of honey-dew exude. This honey-dew often makes the leaves of trees sticky and glossy; and we often see beneath trees what looks like drops of rain on the sidewalks, but it is only tiny drops of honey-dew that have fallen to the pavement The ants are very fond of this sweet liquid. Sometimes we find Plant-lice on shrubs and plants, that are taken care of by the ants. All other insects are kept down, and the ants go about among the Aphids and seem to be taking the best of care of them. They are often called the ants cows. The ants gently stroke them with their antennæ, and are rewarded with drops of honey-dew.

Almost every year the Aphids get on my rose-bushes. They suck the juices from the tenderest parts of the plants. I nearly always find the ants taking care of them. One day while studying them I took a lead pencil, and, imitating the ants, gently touched the Aphids on the backs, and tiny drops of honey-dew came forth.

HOP-PLANT LOUSE

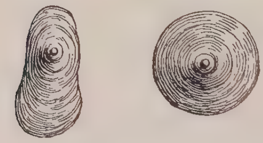
The life-history of these little insects is very interesting. That of the different species varies somewhat, but in general are much alike. The Hop Plant-louse is well described by Howard. This is the worst enemy of the hop-vine, and is found pretty well distributed over this country. The eggs are laid on the twigs of plum-trees, on or just below the buds. In the spring the eggs hatch just as the buds are opening. This generation is composed entirely of females which are known as stem-mothers. They are wingless and are self-fertile. In a few days they give birth to living young (the eggs hatching before they are laid) that are also wingless females. The third generation are females, but they have wings. By this time the young hop-vines are getting a start, and the insects fly to these vines and continue to produce wingless females. This process is repeated until about the twelfth generation, and the month of September has arrived. Now the hop-vines begin to die, as they are annual plants. At this time all the Plant-lice have wings, but they are all females. They fly back to the plum-trees. The last ones born on the hop-vines are true males, the first and only time that males appear in the life history of these insects. These males fly over to the plum-trees. The females that preceded them have given birth to true wingless females. These mate with the males and then lay eggs on the plum twigs, which develop the next spring. The Aphids die before winter.

The most destructive Plant-louse known is probably the Grape Phylloxera. It lived on the wild grape-vines in America and did no harm. It was accidentally introduced into France and nearly destroyed all the grapes. It is said to have cost the French nation more than the indemnity they had to pay the Germans at the close of the Franco-Prussian War, and they are still laboring with this pest.

SCALE-INSECTS

Family *Coccidæ*

Here we have a family that is very large, and the members numerous, yet they are among the smallest of insects. In size they range from a quarter of an inch long to less than the size of a pin-head. The most troublesome species are small. We use the name Scale, because many species exude a waxy substance which forms a complete scale-like covering over the body. These insects vary wonderfully in habit and appearance. Some produce living young and others lay eggs. In many species the females are the most degraded of insects, having no antennæ, no wings, no eyes, no legs. They have a long tongue, which is placed beneath the bark of twigs, and by means of which they obtain their food. They generally have tiny legs at first, but nature removes them after the tongue becomes firmly fixed. The male passes through complete metamorphosis, but it has only one pair of gauzy wings when mature. It also has antennæ, eyes, and legs. It has no mouth, but instead has an extra pair of eyes. As it takes no food, it lives only a few days at the longest.



SAN JOSÉ SCALE

The most troublesome of all these little pests is the San José Scale (pronounced *San Hozay'*). It is a native of China and Japan, and in some way became introduced into America and has spread into every State in the Union. In a great majority of the States, laws have been passed to restrict its spread. These are generally quarantine laws, but this Scale is no respecter of law. The San José Scale is scarcely larger than a pin-head, round, of a grayish color, and often is so numerous as to completely cover the branches and twigs. Although it is very small, yet during the last twenty-five years it has probably attracted nearly as much attention as all the other insects taken together. Thousands of orchards have been destroyed or badly injured. The best known remedy is to spray the trees, in winter, with a wash made of lime and sulphur. In the vicinity of New York, this insect is decreasing. Probably some natural enemy has developed.

Boys are sometimes asked to scout or search for Scale insects. One kind called the Cottony Maple-scale is often common on the lower branches of maple-trees and on grapes. It is a large scale surrounded by a cotton-like mass. Another kind is shaped like an oyster-shell. It often nearly covers the branches of lilacs and other shrubs or trees. The Rose-scale is sometimes abundant on roses, especially on those that grow in the shade. They are white in color. A large soft Scale infests tulip-trees. Try scouting for Scales, and see if you cannot find some of these pests.

BEETLES

Order *Coleoptera*

THE insects belonging to this order have four wings; the outer pair are hard or horny and act as a shield to protect the wings and body beneath. These wing covers are called elytra. The under or true wings are membranous. They are generally so large that they have to be folded in order to be covered by the elytra.

The mouth parts are generally well developed and are adapted for biting or chewing. They feed on a variety of substances, both animal and vegetable. Some, as the Colorado Potato-beetle, are very injurious; others, like the Lady-birds, are useful.

Their metamorphosis is complete. The larvæ vary wonderfully. They are generally called grubs. They have six true legs, except in the group known as Snout-beetles, which have no legs.

They generally transform in the ground, where they make a rude cocoon of earth, sometimes of bits of wood, cemented together by a secretion from the body. Wood-boring species usually transform in the tunnels. Some use the last larval skin.

About 12,000 species of this order are known to exist in North America north of Mexico. Many of these are very similar in structure and habit. A microscopic study of the antennæ, legs, and feet is often necessary in classifying these insects, therefore, for our purpose we can describe only the more familiar and conspicuous species.

TIGER-BEETLES

Family *Cicindelidæ*

Sometimes while walking along the sandy roads we see a bright green Beetle, marked with yellow or white, fly up and drop down again a few feet before us. These are the TIGER-BEETLES. They have large eyes, strong jaws, long legs, and can run rapidly. Most Beetles are rather clumsy in getting started to fly, but not so with the Tigers. They are up and off like a flash. They seem to like the bright sunshine and sandy roads; some species inhabit the seashore, and a few are nocturnal. They dig holes in the sand, which are probably used for secreting their eggs. The larva is not beautiful, but it is interesting. It makes a burrow a few inches deep and lies in it with its head just at the surface of the ground. Its clay-colored head makes a good plug for the hole. Should any insect come near its open jaws, it is quickly grabbed and taken down the dark retreat. It has a hump on its back, with two hooks which prevent it being pulled out of the hole, should it grab an insect too large and strong for it to manage.

Tiger-beetles are difficult to capture, but they are beautiful in collections. They get their name from the habit of pouncing upon other insects. They are found nearly all over this country, but the largest species inhabits the plains of the Middle West.

GROUND-BEETLES

FAMILY *Carabidæ*

THIS is a very large family, and includes a number of the common Beetles that we see. They are often found under stones, boards, or other objects, or on the ground beneath dense grass. The majority of them are shiny black, but a few are dark brown, and others are quite brilliantly colored. They nearly all feed on other insects; just a few eat vegetable matter. Their legs are well adapted for running and they are ready to bite when caught. The larvæ live just beneath the surface of the ground and live on other insects, especially the larvæ of leaf-feeding Beetles that go into the earth to pupate.

One of the best known of the ground Beetles is called the SEARCHER, or CATERPILLAR-HUNTER (*Calosoma scrutator*). It is about an inch and a half long, with wing covers of violet green, margined with red. The thorax and under part of the body is violet, green and gold. It is usually found running on the ground or climbing trees. It is said to make war on the tent caterpillar, and without doubt does much good. My experience is that they are more likely to be found in city parks than they are far out in the country. I recall one summer evening while seated in one of the small parks in Washington, D. C., I saw dozens of these insects searching about the ground or climbing trees. Without doubt they are very useful.

The FIERY HUNTER (*Calosoma calidum*) is a common and widely distributed species. It gets its name from the rows of reddish or copper-colored pits or dots on the wing covers. It is found under stones and other objects in fields and open spaces. It feeds on cut-worms, canker-worms and other larvæ. In size it is a little smaller than the Searcher.

BOMBARDIER BEETLES

In this group each member carries a little sack, at the rear of the body, filled with a bad-smelling fluid which it squirts on its enemies. Some other Beetles can also do this, but in the case of the BOMBARDIERS, the explosion sounds like a tiny pop-gun, and the liquid coming in contact with the air forms a smoke-like gas.

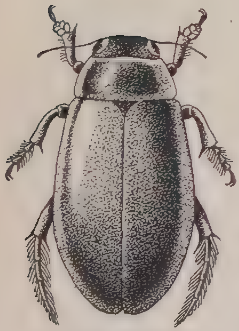
Comstock says: "When some larger insect tries to capture one of the insect-soldiers, and gets very near it, the latter fires its little gun into the face of its enemy. The noise astonishes the pursuer and the smoke blinds him. By the time he has recovered from his amazement, the little Bombardier is at a safe distance. These Beetles have quite a store of ammunition; for we have often had one pop at us four or five times in succession while we were taking it prisoner." The Bombardier Beetles have wing-covers that are black or dark blue, sometimes with a greenish tinge. The legs, head, and pro-thorax are reddish-yellow. They are usually found on the ground.

BOMBARDIER BEETLE

DIVING BEETLES

FAMILY *Dytiscidæ*

THIS is quite a large family of WATER-BEETLES. They seem to prefer standing-water or quiet pools. They have the habit of hanging head downward from the surface of the water with just the tip of the rear end of the body projecting into the air. The breathing tubes are beneath the wing-covers, and air can get under these from the rear. When disturbed these Beetles dive beneath the water, carrying air down with them under the wings. They are generally black or brownish in color, oval in shape, and vary in size, the largest being about an inch and a half long. The hind legs are well fitted for swimming, being large, flattened



DIVING BEETLE

and fringed with hair. These Beetles are very voracious; they not only eat other insects, but attack very small fish, and they frequently do much damage in carp ponds. The larva is just as savage. It is called the "Water-tiger." It has a large head with long, sharp, curved mandibles which are hollow with a slit-like opening near the end. This is just adapted to grasping a live insect and sucking its blood at the same time.

WHIRLIGIG BEETLES

FAMILY *Gyrinidæ*

ANYONE who has rowed a boat, or paddled a canoe on ponds or quiet streams, could scarcely have helped noticing the little WHIRLIGIG BEETLES as they go round and round on the surface of the water. They seem especially abundant on quiet summer evenings, often dozens of them lying motionless on the surface of the water or swimming round and round after each other in graceful curves. When caught they generally emit a milky fluid with an unpleasant odor.

WHIRLIGIG BEETLE

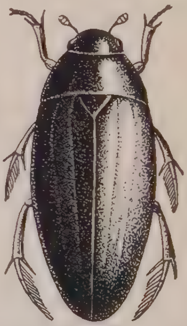
One common species has a pleasant odor, and is sometimes called, by boys, PERFUMERY-BUG.

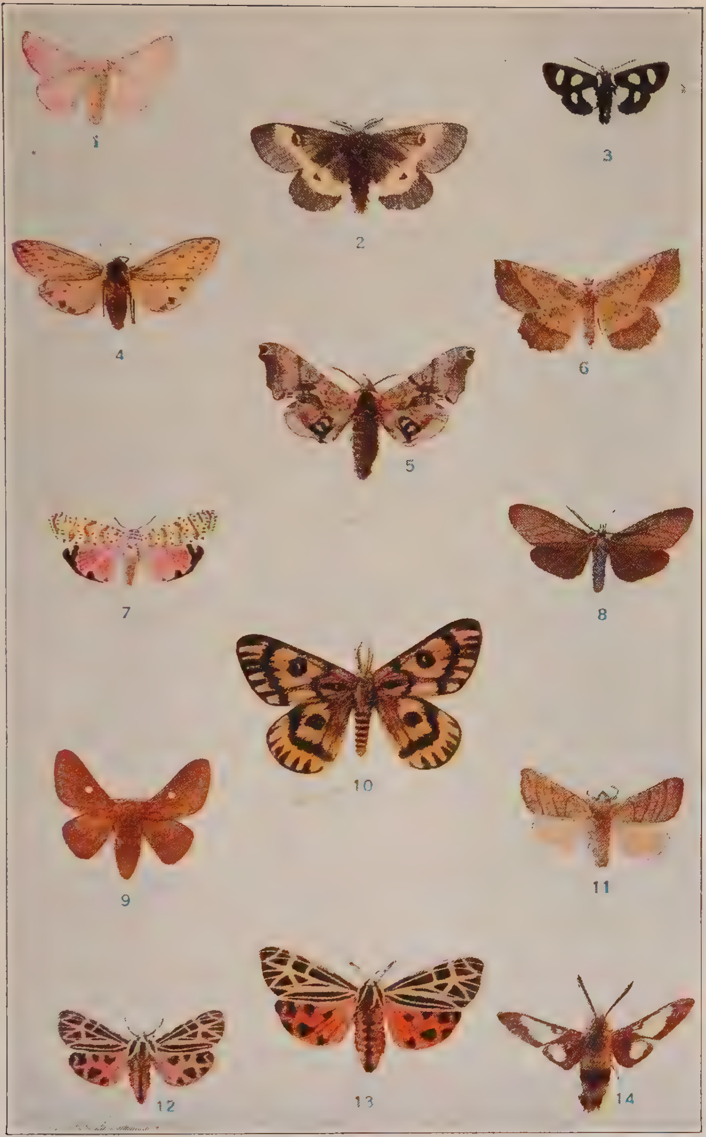
They are bluish-black with a metallic luster, and the hind legs are adapted for swimming. One of the interesting things about them is their eyes. These are divided by the margin of the head into an upper and lower half in a way that we sometimes see spectacles divided. The lower half is adapted for seeing under water and the upper half for seeing in the air. Both the mature Beetle and the larva feed on other insects.

WATER-SCAVENGERS

FAMILY *Hydrophilidæ*

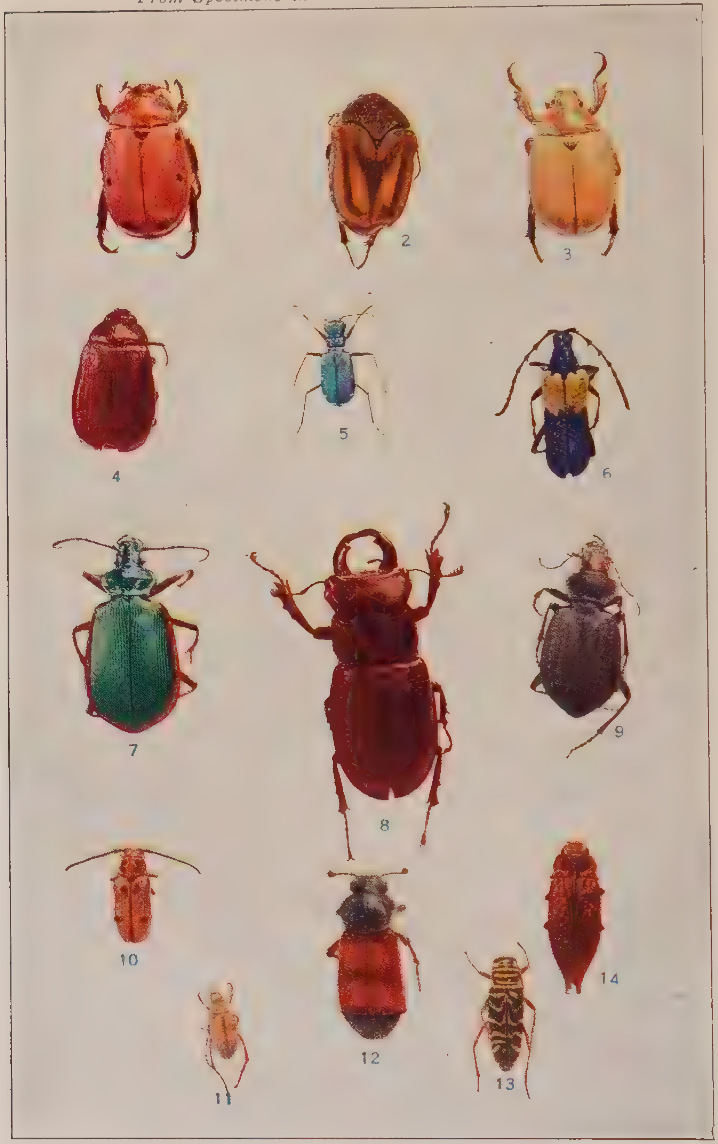
THE insects belonging to this family resemble the Diving Beetles in shape, but they have short club-shaped antennæ, generally bent under the head, and when swimming they use the hind legs alternately. When coming to the surface for air they hang head up. The air spreads in a film on the under surface and is held there by soft short hairs, giving that part of the body a silvery appearance. As their name indicates, they feed on dead organic matter, but some species will also take living material.


WATER-SCAVENGER



1—Rosy Maple
2—Maia Moth
3—The Forester
4—Isabella Moth
5—Twin-Spot Sphinx
6—Saw-Wing
7—The Beautiful Uththeisa
8—Virginia
9—Spiny Oak Worm
10—The Clown
11—Yellow-Necked Apple Moth
12—Tiger Moth (male)
13—Tiger Moth (female)
14—Bumblebee Moth

All 1/2 natural size



From Specimens in the American Museum of Natural History

1—Grape Beetle
2—The Fig-eater
3—Goldsmith Beetle
4—June Bug
5—Tiger Beetle
6—Cloaked Knotty-horn
7—The Searcher
8—Stag Beetle
9—Fiery Hunter
10—Milkweed Beetle
11—Rose Beetle
12—Burying Beetle
13—Locust Borer
14—Metallic Wood-borer

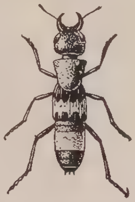
All natural size

The largest species is nearly two inches long, shiny bluish-black, and is able to fly from pond to pond. They often collect about electric lights.

ROVE-BEETLES

FAMILY *Staphylinidæ*

THESE insects are known by the very short wing-covers, leaving much of the body exposed. They are widely distributed over the whole country. There is one species, with yellow markings on the abdomen, that I find very common on certain species of decaying mushrooms. It can run quite rapidly; and touch it on the back and it flings its tail up over the back as though about to sting. This is a splendid example of protective mimicry, for in color it much resembles a wasp. ROVE-BEETLES feed on decaying organic matter and must be counted beneficial.



ROVE-BEETLE

Kellogg says: "In California, great swarms of minute Rove-beetles dance in the air in April and May, and are a woeful nuisance to people driving or bicycling. They get into one's eyes, and when crushed by rubbing, their acrid body-fluids both smell bad and burn."

CARRION-BEETLES AND BURYING-BEETLES

FAMILY *Silphidæ*

THESE two groups are members of the same family. Though varying in appearance they have much the same habits. They both feed on decaying animal matter, and may be obtained for study by leaving a piece of raw meat or dead animal on the ground and examining it daily. Some species feed on decaying vegetable matter.

The antennæ of both of these Beetles have the last segments or end formed into a ball, which is very sensitive to odors of decay.

The BURYING-BEETLES are very interesting. Their name is derived from the habit of burying their food. When they find a dead bird or mouse, they dig under the body until it settles down into the ground, and when deep enough, they cover it. Then the female digs down and deposits her eggs on the body, and the larvæ feed upon it.

One morning I found a dead blackbird in the woods. A pair of Burying-beetles had apparently just located it. They began to remove the soft ground beneath the body and worked so diligently that by night the bird was completely buried.

The Burying-beetles are large, from an inch to an inch and a half long.

The bodies are stout and parallel-sided. The most common ones have reddish spots on each wing cover. The spots are sometimes large and give them a banded appearance. The CARRION-BEETLES are usually smaller, with broad, flat bodies. Both kinds are found all over the United States and are of use in disposing of dead animal matter.

LADY-BIRDS, OR LADY-BUGS

FAMILY *Coccinellidæ*

NEARLY every boy and girl knows the little LADY-BUGS. They are round or oval, smooth, and glossy. As a general rule, they are reddish-brown or yellowish with black spots, or black with yellow or reddish-brown spots.

LADY-BIRDS and their larvæ are among the most valuable of all insects. They feed especially on plant-lice and scale-insects. Their eggs are laid on the leaves of plants or trees, and the larvæ at once search for insect eggs or plant-lice. I have watched nearly a full-grown larva go up to a mass of eggs deposited by some larger insect and eat them one by one. When he had finished his meal he went marching up the twig looking for more. They seem never satisfied. These Beetles are found all over the country. In California, where fruit-growing is so important, an Australian scale threatened the destruction of the orange groves. Some Lady-birds, the enemy of this scale, were imported from Australia and placed on the infested orange trees. By the aid of man, they were so scattered over the area affected by the scale, that in a few years this pest was put completely under control and has remained so ever since.

The TWO-SPOTTED LADY-BUG (*Adalia bipunctata*) is the most common species of the East. It is reddish-yellow, with a black spot on each wing cover. In autumn it often comes in the houses to hibernate, and should be protected, not destroyed.

DERMESTIDS

FAMILY *Dermestidæ*

WHERE boys have collections of Moths, Butterflies, and other insects, they sometimes find that pests have gotten into them as indicated by fine dust beneath the specimens and that their legs and wings are dropping off. These pests are called DERMESTEDS, stout little Beetles, generally mottled, black and white. But it is not the Beetles themselves but the larvæ that do most of the harm. They feed on insect specimens, mounted birds and mammals, also on woolens, furs, feathers, and cured meats. The larvæ are covered with hairs, with a bunch of bristles on the end of the tail. Insect boxes should be made as tightly fitting as possible; and a little carbon disulphide poured in one corner of the box, then quickly closed, will kill these pests.

The LARDER BEETLE belongs to this group. It gets its name from the habit of getting into places where ham and bacon are stored. The wing covers are brownish-yellow. The larva is more often seen than the mature insect.

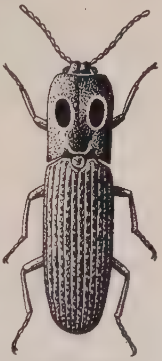
Another pest belonging to this family is the CARPET BEETLE. It is very apt to attack carpets and furs. Many housekeepers speak of the larva as the Buffalo-moth. It is a fat grub, not a quarter of an inch long, and clothed in dark-brown hair. The Beetle itself is tiny, mottled black and white. It lives in cracks in the floor and generally works on the under side of carpets.

CLICK BEETLES

FAMILY *Elateridæ*

THESE interesting insects are also called SKIP-JACKS, SNAPPING-BUGS, and SPRING BEETLES, from their habit of jumping into the air with a click when placed on their backs. There are many species, most of them are brown or black, from half an inch to an inch long. Their larvæ are yellowish-brown, slender, and very tough. They live in the ground or in decayed wood and are called Wire-worms. Many species feed on the roots of plants, and sometimes are destructive to cultivated crops.

The largest Click Beetle, at least in the East, is the EYED ELATER (*Alaus oculatus*). It varies wonderfully in size. I have found it two inches long, but as a usual thing it is shorter. Its color is dark, sprinkled with fine white blotches, or what is often called pepper and salt. It has two large eye-spots on the pro-thorax, velvety black, rimmed with white. They are very distinctive, and enable one to distinguish the Beetle at once. These spots are not really eyes, however. The real eyes are at the side of the head, near the antennæ.

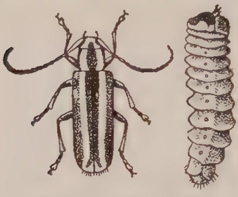

CLICK BEETLE

Most country boys are familiar with the Click Beetle, and many have spent hours, as I have, turning them on their backs and watching them snap up into the air until they land on their feet.

METALLIC WOOD-BORERS

FAMILY *Buprestidæ*

THIS is a large and important family of Beetles that in many respects resemble the Skip-jacks, only they do not have the power of springing into the air, and the back part of the body is more tapering. They are generally beautifully colored, and shine like burnished metal. Some are green blue or violet, and others are like gold or copper. The mature insects are often found on flowers; some of the larger species have the habit of resting on the bark of trees. The larvæ bore in wood and some species do a lot of damage. One of the worst of these is called the FLAT-HEADED APPLE-TREE BORER (*Chrysobothris femorata*). It is a greenish-black Beetle, half an inch long, with the under parts like burnished copper. During June and July it lays its eggs on the bark of tree trunks, and the young eat through into the sap-wood. As they grow older, they eat into the solid wood. Pupation takes place just beneath the bark, and the adult Beetle comes forth almost a year after the eggs were laid. It attacks not only apple-trees, but peach, plum, shade and forest trees as well. The bark of small trees is often rubbed with soap to prevent the pests from depositing their eggs. This insect ranges over the entire country.


ADULT BEETLE AND LARVA, ROUND-HEADED APPLE-TREE BORER

Another Wood-Borer is known to insect men as *Dicerca divaricata.* It is about three-fourths of an inch in length. The upper side is of a coppery or brassy color. The tips of the wing-covers are separated, and this makes it easy to be identified. It bores in birch, maple, and other deciduous trees.

FIRE-FLIES

FAMILY *Lampyridæ*

THESE are not Flies at all, but soft-bodied Beetles, with thin, leathery wing-covers and flexible abdomen. They have the power of self-illumination, or displaying a shining light at will. The light is entirely under the control of the insect, and the luminous spot is on the under side of the last abdominal segment. Why do they give out this illumination? That is a disputed question. Most authors think that it is to attract each other. Some think that it is a warning signal, for it is said that

FIREFLY

they are rarely eaten by birds. The light emitted is the most perfect light known. That is, all the rays are light rays: practically no heat rays are given out.

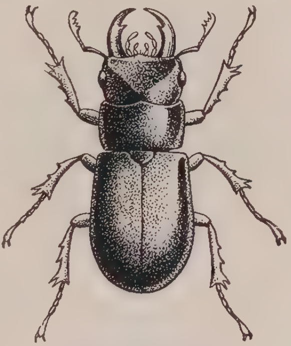
In some parts of the country the boys call these insects "LIGHTNING-BUGS." They are most numerous from the first to the middle of July, and are often active on warm summer evenings just before rains.

In England, the GLOW-WORM is a wingless female Fire-fly. Only some of the Beetles belonging to this order are luminous. In a few species, the eggs, larvæ, pupæ and mature insects all glow. The larvæ are found under logs, bark, or in the ground. In spading my garden in the springtime, I have turned up the luminous larvæ.

STAG-BEETLES

FAMILY *Lucanidæ*

THIS is not a large family, but a very conspicuous one, from the large curved mandibles, in some cases branched like the antlers of a stag. The larvæ live in decayed wood and are large white grubs. It is said that in some species it takes six years to complete their growth. I have cut them out of the decayed trunks of apple-trees, and have found them in partially decayed stumps.



STAG-BEETLE

The GIANT STAG-BEETLE (*Lucanus elephas*) is a common insect of the Southern States. It is from an inch and a half to two inches long, and this does not include the large curved branching horns which in the male are an inch longer.

HORNED PASSALUS

The COMMON STAG-BEETLE of the Eastern States is *Lucanus dama*. It is a rich mahogany brown, with long curving mandibles in the males. Most boys are familiar with them and call them "PINCHING-BUGS." They often fly about electric lights, and sometimes fly into lighted houses, where they make a loud buzzing sound, striking the walls after the manner of the June-bug.

Another species, the HORNED PASSALUS (*Passalus cornutus*), is so called from a short horn bent forward on top of the head. They are often very numerous in old decayed stumps. They have two well-developed pinching jaws. These shiny black Beetles are about an inch and a half long. When you pick them up they make squeaking sounds. The larvæ, fat white grubs, are found in decayed stumps. They are often common about old slab-piles, and furnish food for snakes.

DUNG-BEETLES, OR LAMELLICORN BEETLES

FAMILY *Scarabæidæ*

THIS is a large family and the members vary wonderfully in habit and appearance. Their bodies are generally short and stout, and the antennæ are short, club-shaped, and the ends are divided into several leaf-like parts. These insects naturally fall into two groups, the scavengers and the leaf-eaters.

The scavengers are generally known to boys as "Tumble-bugs." They have the habit of rolling balls of dung. The most common species is the COMMON TUMBLE-BUG (*Canthon lævis*), a stout black Beetle, about three-fourths of an inch long. They work in pairs, male and female, and often roll balls several times larger than themselves. I have often watched them roll these balls along the roadside. One gets back of the ball, elevates the rear of the body, and kicks the ball along with its hind legs. The other one steers it, generally going in front with his hind feet on the ground and his front ones on the ball. After rolling the pellet for a long distance and until it becomes round and hard, they dig a hole and bury the ball. The female then places an egg in it, and the larva feeds on this partially decomposed matter. Comstock says: "It should be noted that this is one of the instances, rare among insects, where the male realizes that he has some responsibility as a father, and assists the female in providing for the young."

COMMON TUMBLE-BUG

COMMON DUNG-BEETLE

The COMMON DUNG-BEETLE (*Copris carolina*) is a large, well-known species, more than an inch long, black, and very thick. It is probably one of the strongest creatures for its size in the world.

These insects do not roll balls, but instead dig holes directly beneath or near piles of manure, and this substance is carried into the holes, and furnishes food for the larvæ. They dig with the head, a little after the manner of a hog rooting with its snout. They also use the feet for digging and taking the ground out of the hole. I am convinced that they do most of the work at night. Those species that roll balls may be seen at work in the bright sunlight. They are sometimes turned up by the plow. When a small boy, I followed after a plowman until I had collected several Beetles of this species and put them in tin cans with sand, and in this way kept them for weeks.

Leaf-eating Lamellicorns

Some members of this family feed on the leaves of plants or on the pollen and petals of flowers. May Beetles or June-bugs are good examples. These are the smooth brown Beetles that fly into the doors and windows of our houses in the early summer. They make a loud buzzing noise as they fly about and bump against the walls. The larvæ of these Beetles are called White Grubs, and often the name "Grub Worm" is applied. They are known to nearly every farm-boy.

The Rose-bug (*Macrodactylus subspinosus*) is one of our worst garden pests. They not only eat the petals and pollen of roses, but attack the grapes just as they come in blossom, and sometimes nearly destroy the crop. Touch them and they tumble to the ground. A good way to destroy them is to allow them to drop in a basin of hot water or one containing a little kerosene.

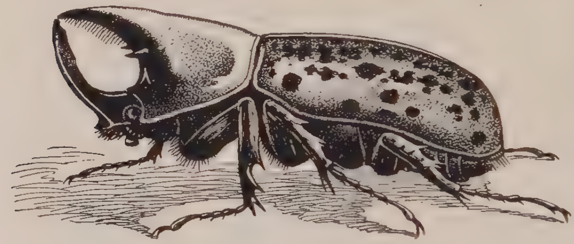
The Rose-beetle is colored yellowish-brown, and is about three-eighths of an inch long. Not the largest Beetle has the longest name, however. A few years ago I was traveling on a train in the State of Ohio when a man came to me and, after calling me by name, asked if I remembered, when in college, another student coming to my room one evening with a Beetle for me to identify. I had forgotten both the young man and the incident, but he said I told him it was a Rose-beetle, and gave him the scientific name, which he committed to memory, the only one he ever learned. He added that after that when any person brought him a plant or an insect to name, he looked very knowing and wise and said: "Sir, that is the *Macrodactylus subspinosus*," and they thought him very learned.

Another leaf-eater is the Gold-smith Beetle (*Cotalpa lanigera*). This very beautiful insect is about an inch long, colored a bright lemon yellow, and is smooth and glossy. The head and thorax look like gold. The under side is coppery, covered with whitish wool.

A similar Beetle in size and shape is the Spotted Vine-chafer. It is yellowish-brown, with three round black dots on each wing-cover. The under side is very dark green. The larva feeds on decaying wood, and the mature insect on the leaves of the grape. They are generally not numerous enough to do much damage.

RHINOCEROS BEETLES

THOSE belonging to this group are called Rhinoceros Beetles because the males have long horns on the head. They are the largest Beetles found in this country. One of the largest and best known is *Dynastes tityrus*. It is greenish-gray, with many black spots on the wing-covers. The male has a long horn on the head and a large one and two smaller ones on the front part of the thorax. It is found throughout the Southern States, where they feed upon figs. A similar species is found in the far west, only the horn on the thorax is much longer. In the West Indies there is a Rhinoceros Beetle that measures six inches long.


RHINOCEROS BEETLE

I will mention but one other Beetle belonging to this family. That one is the FIG-EATER (*Allorhina nitida*). It is a common insect on the Atlantic Slope and through the Southern States. It is usually about three-fourths of an inch long. Its color is a beautiful velvety green. It often buzzes about lamps after the manner of the June-bug. Sometimes boys bring me this Beetle for identification. Perhaps they are attracted to it by the rich coloring of its wing-covers.

LONG-HORNED BEETLES

FAMILY *Cerambycidæ*

THE members of this large family are recognized by their long antennæ, which in some cases are much longer than the body. They have long legs, and many species run rapidly. Sometimes they come around the camp-fires in the woods, and when picked up some kinds make a squeaking sound.

The larvæ are wood-borers, and live beneath the bark, or bore in the solid parts of trees.

The Cloaked Knotty-horn (*Desmocerus palliatus*) is one of the most beautiful of all our Beetles. The greater part of the body is of a rich blue color. The front part of the wing-covers is a rich orange-yellow, and gives the insect the appearance of having a cloak thrown over its shoulders. This Beetle is about an inch long. The larva bores in the pith of the elder, and the mature Beetle is generally found on that shrub.

The Maple-borer and the Locust-borer are two beautiful insects that much resemble each other. The Locust-borer is black, with wavy yellow bands. It is often found on the goldenrod blossoms. They lay their eggs on the trunks of trees, and the larvæ bore through the bark and into the solid wood. Many locust trees are killed or injured from the ravages of this insect.

The Red Milkweed-beetle (*Tetraopes tetraopthalmus*) is a common species on the milkweed. It is brick red, with four black spots on each wing-cover. The larvæ bore in the lower stems and roots of the milkweed.

LEAF-BEETLES

Family *Chrysomelidæ*

These are short-bodied, oval Beetles, nearly all small, and both the larva and adult feed on leaves. The family is a large one. One of the best known is the Colorado Potato-beetle, familiar to every country boy. It originally lived along the base of the Rocky Mountains, and fed on the wild sand-burs, plants that belong to the same family as the potato. When settlers moved into that region, this Beetle became a serious pest on the potatoes, and, going from field to field, soon found its way to the East. The yellow egg masses are placed on the under side of the leaves. The larvæ are brownish-red and eat voraciously. They go into the ground to pupate. This was the worst insect pest of my boyhood. I often spent hours knocking the Beetles and larvæ into a pail and destroying the eggs, or in sprinkling the potato stalks with Paris-green or arsenate of lead.

Other nuisances belonging to this family are the red, yellow, and black Asparagus-beetle, that eats holes in the asparagus stalks; the Elm-leaf Beetle, which was introduced from Europe and has almost ruined the elm trees in some sections; also the Cucumber-beetle, so troublesome on the young cucumber vines.

SNOUT-BEETLES

SUBORDER *Rhynchophora*

SNOUT-BEETLE

THE SNOUT-BEETLES, or Weevils, as many forms are called, have the head elongated into a snout, which in some cases is long and curved. The antennæ are on the snout. The mature Beetles are not often seen, but the larvæ are familiar to all. They are the fat, white, wrinkled worms found in chestnuts, acorns, and hickory-nuts. The "worms" of plums, peaches, and cherries also belong here, and such pests as the COTTON-BOLL WEEVIL. The Beetle that infests the acorn is a good type. When the acorn is young and quite soft, the Beetle takes its beak and punches a deep hole in it, and then deposits an egg in the hole and pushes it down with its snout. The egg develops into the white larva or grub.

This is a large group of insects, and many of them are troublesome.

BUTTERFLIES AND MOTHS

ORDER *Lepidoptera*

THE members of this order have four wings covered with scales; mouth parts in the mature insect adapted for sucking in the larva for biting; and the metamorphosis complete. In this order we have the most familiar examples of complete metamorphosis. Nearly every boy knows a few Caterpillars, and many have gathered cocoons, but it is not often that we associate the Caterpillar with the Moth or Butterfly that it develops into.

The word Lepidoptera means scale-wing; and if we touch or rub our fingers over a Butterfly or Moth, we find that dust or powder comes off and sticks to the finger. If this dust is placed under a microscope we find that it is composed of scales. The wing of a Butterfly or Moth is a very beautiful object under a compound microscope. The scales are often beautifully colored and lap over each other like the scales of a fish, or shingles on the roof of a house. On the edge of the wing the scales are often long and fringed. The body is also covered with scales, but they are generally long and hair-like. The scales have probably developed from hairs. The word "miller" is often applied to the small light-colored

Moths. This without doubt comes from the fact that the wings and body are covered with a white or light flour-like powder, the scales, just as the clothes of the old-fashioned miller became covered with flour-dust.

The tongues of MOTHS and BUTTERFLIES are long, and when not in use are coiled up like watch-springs. They are hollow tubes, and in the case of some Hawk-moths are four or five inches long. They suck nectar from flowers, as boys suck soda-water through straws.

Caterpillars change their skin or molt several times before they become full grown. A good way to study this is to raise Caterpillars by collecting them when small and by feeding them on the plants on which you found them. In this way I have taken a number of Butterflies and Moths through the different stages of their life-history, and have always found it interesting. We once had two boys in a summer camp who collected all the different species of Caterpillars they could find. They placed them in boxes and every day put in fresh food. These insects do best when a little water is sprinkled on the leaves. At times these boys had as many as thirty different species of Caterpillars, and without doubt they learned much about the habits and life-histories of the various kinds.

I am sometimes asked to explain the differences between a Butterfly and a Moth. Here are some of them. The body of a Moth is generally shorter, heavier and more covered with hair than that of a Butterfly. When at rest, the wings of a Moth are spread horizontally, or are folded roof-like on the abdomen. Some are wrapped around the body. The wings of a Butterfly are folded vertically above the back. The antennæ of a Moth are generally thread-like or feather-like, those of a Butterfly are knobbed or enlarged at the end. The group known as SKIPPERS are generally included among the Butterflies, but are quite moth-like in character. Moths usually fly at night, and Butterflies during the day—the brighter the sunshine, the better.

There are about six thousand species of Moths in this country, and six hundred species of Butterflies; therefore in number of species Moths are ten times more numerous than Butterflies. In the pages that follow we will describe only the more common species of each.

BUTTERFLIES

The MONARCH, or MILKWEED, BUTTERFLY (*Anosia plexippus*) is a common species found over almost all of this country. This is the large deep-orange or tawny-brown Butterfly, with the veins and margins of wings bordered with black. The larva feeds upon the milkweed. When full grown it is light yellow, often with a greenish tinge, and broadly banded with black. The chrysalis is about an inch long, light green and dotted with gold. It remains in the pupa state about two weeks and then emerges a complete insect. Generally three broods are produced in a summer.

Monarch Butterflies migrate like birds. While undoubtedly many of them die in autumn, a large number fly to the South. They are strong fliers, and are able to go many miles at a time. In their northern migrations, I have seen them half way across Lake Ontario. One fine day in October, while deep-sea fishing, I saw them wending their way from Long Island to the New Jersey Coast. Although we were many miles from shore, I saw as many as five at one time hovering about the boat.

I recall another incident of their fall migration. One frosty morning in autumn, while walking through a piece of woodland, in Southwestern Pennsylvania, which was protected from the cool west winds, I discovered thousands of Monarch Butterflies clinging to the bushes and branches of trees. As the day grew warmer, they gradually left for the South; often dozens could be seen in the air at one time. During the winter, the Monarchs either breed in the South or hibernate there; and early the next summer the females find their way to the North, even going into Canada. This Butterfly is a great traveler. It is now common in South America and the islands of the Pacific, and is becoming plentiful in Australia. It is even getting a foothold in western Europe. Owing to the disagreeable juices, birds do not touch the Butterfly or the larva.

The Fritillaries, or Silver-spots (*Argynnis*)

The Butterflies belonging to this genus are from medium to large size. The upper side of the wings is reddish-brown with black markings and spots or wavy cross-lines. The under side of the hind wings usually has large silvery spots.

This is a large genus and the species are difficult to separate. More than fifty species are found in the United States. They are among the most common Butterflies to be found in this country. We will describe only one species.

The Great Spangled Fritillary (*Argynnis cybele*) is perhaps the best known species of the East. It is a large Butterfly, expanding from three to four inches. The wings are reddish-brown, thickly spotted with black. In the female, the basal half of both fore and hind wings is a rich chocolate brown. The caterpillar when full grown is black, with six rows of black branching spines. It feeds on violets, and is active during the night, and is concealed or in hiding during the day. This species is found all through the East as far west as Nebraska. Very similar ones are found in the Rocky Mountains and the far West.

THE ANGLE-WINGS (*Grapta*)

These are medium-sized Butterflies that get their name from the peculiar margin of both front and hind wings, which are angular and cut or notched. The upper side of their wings is brownish or tawny, spotted and margined with black. The under side is colored like a dead leaf, and often with a narrow curved silvery spot on each hind wing. During the winter they hibernate in the adult stage in hollow logs, trees, or under stumps. They are among the first Butterflies seen in the spring. The caterpillars feed chiefly on plants and trees of the nettle family.

The VIOLET-TIP, or QUESTION-MARK BUTTERFLY, (*Grapta interrogationis*) is a very common angle-wing. It is found all over the United States except the Pacific Coast, and it is a common insect of Canada. It is double-brooded in the Middle and Southern States.

This is the largest of the Graptas in this country. It is a light reddish-brown above, with dark spots and darker near the border. There is faint blue on the margin, and the tip or tail has a violet tinge. On the under side there is a silvery mark much like a semicolon, and slightly resembling a question-mark or interrogation-point. The larva is brown, with black spines.

The COMMA BUTTERFLY (*Grapta comma*) is much like the Question-mark, only smaller. There is a comma-like spot on the under side. The hop-vine is the favorite food plant of the larvæ.

THE TORTOISE-SHELL BUTTERFLIES (*Vanessa*)

These are medium-sized Butterflies, dark in color and marked with red, orange, or yellow.

The MOURNING-CLOAK BUTTERFLY (*Vanessa antiopa*) is one of our most beautiful species. It is found over almost this entire country and is very common in Europe. In England it is called the CAMBERWELL BEAUTY. Its general color is deep purplish-brown, nearly black, with a wide border of light yellow; just within the border is a row of blue dots. The larva is black, with long black spines. They collect in colonies, and sometimes strip the branches of their leaves. They feed on willow, elm and poplar.

The Mourning-Cloak hibernates in the adult stage in protected places such as hollow logs or under stumps lying upon the ground. I have turned over such stumps on cold winter days and have found as many as three beneath one stump. They are among the very first insects to appear in the spring. They like the sap from the maple-trees, and may be seen about the sap-pails at maple-sugar making time. I have seen them out on warm sunny days in the middle of the winter.

GENUS *Pyrameis*

The Butterflies belonging to this group are of average size. The under side of the wings is often more beautiful than the top, on account of the wonderful coloring and eye-like spots of some species.

The RED ADMIRAL (*Pyrameis atalanta*) is a common Butterfly, found throughout North America, also in Europe, Asia, and North Africa. It is of average size. Across the middle of the fore-wings is a bright orange-red band. There are several white spots between this band and the tip of the wing. There is another deep orange band on the margin of the hind wings. Near the middle of this band there is a row of black dots. The larger part of the wings is purplish black.

The larvæ feed on nettles and hops. There are two broods a year, and the insect hibernates in both the pupa and mature form. It is one of the first insects to appear in the spring. Like many other Butterflies, some years the Red Admiral is plentiful and other years it is scarce.

HUNTER'S BUTTERFLY (*Pyrameis huntera*), a beautiful species, is dark brownish-black, with large, irregular, orange spots. There are small white markings near the tips of the front wings. There are two large eye-like spots on the under side of the hind wings. These are good distinguishing features. The larva feeds on cudweed and everlasting.

Hunter's Butterfly ranges over this country as far west as the Sierra Nevada Mountains. It also extends into Canada and Mexico.

The THISTLE BUTTERFLY (*Pyrameis cardui*) is the most widely distributed Butterfly known. It is found in every continent of the globe, including far-off Australia. It is common in many islands of the sea. From its wide distribution it is often called the COSMOPOLITAN BUTTERFLY. In England it is called the PAINTED LADY. Many ladies are painted, and few are more beautiful than this Butterfly. It is colored much like Hunter's Butterfly, but instead of the two eye-spots on the hind wings, it has a row of four or five smaller eye-like spots. A similar species is found on the Pacific Coast.

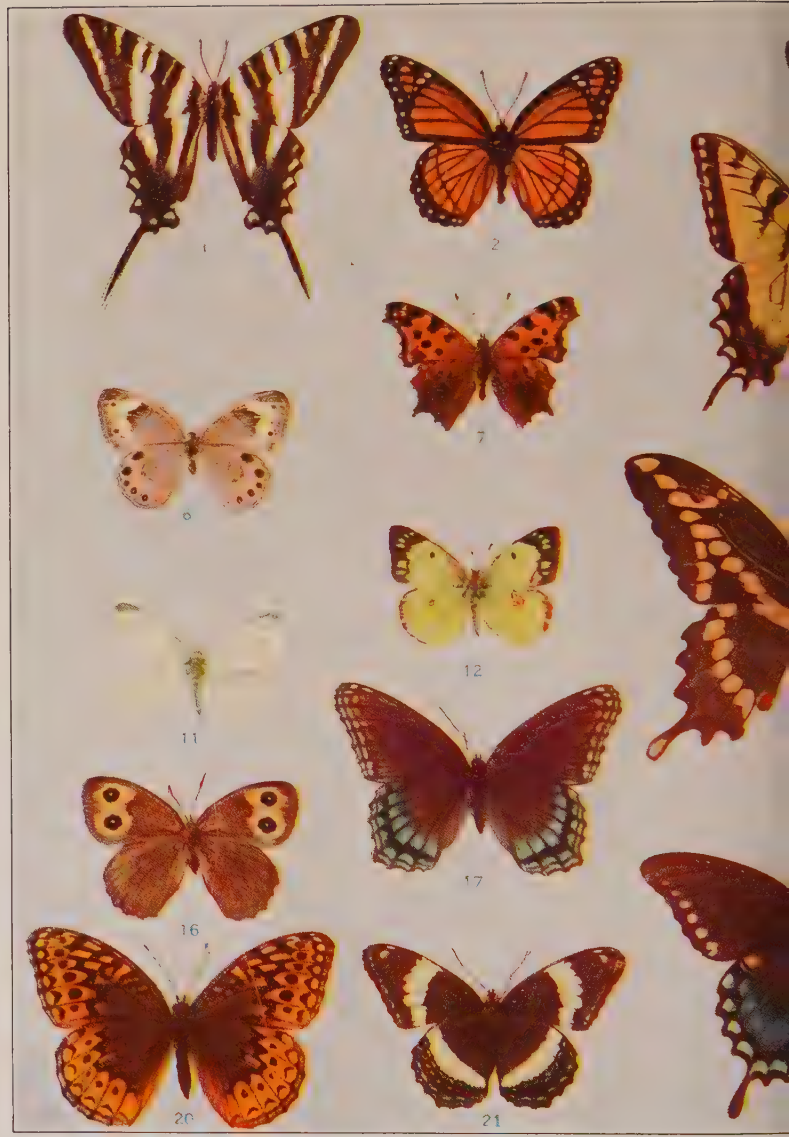
THE SOVEREIGNS (*Basilarchia*)

Here belong some of our finest Butterflies. The head and eyes are rather large. The hind wings are rounded and somewhat wavy. The larvæ are odd or grotesque in form, spotted or mottled, and the second segment has two horn-like prominences. The larva feeds on birch, willow, apple, oak, and other trees and shrubs.

The RED-SPOTTED PURPLE (*Basilarchia astyanax*) has the upper surface of the wings a rich bluish-black, sometimes tinged with green. The outer part of the hind wings has three rows of bluish-green spots. The under

BUTTERFLIES

1. Zebra Swallow-tail
2. Viceroy
3. American Copper
4. Hunter's Butterfly
5. Parsley Butterfly
6. Grass Nymph
7. Comma Butterfly
8. Tiger Swallow-tail
9. The Question-mark
10. Mountain Silver Spot
11. Cabbage Butterfly
12. Common Sulphur
13. Giant Swallow-tail
14. Dog-face
15. Parnassius
16. Common Wood Nymph
17. Red-spotted Purple Butterfly
18. Mourning Cloak
19. Red Admiral
20. Great Spangled Fritillary
21. Banded Purple
22. Spicebush Swallow-tail
23. Painted Lady
24. Monarch



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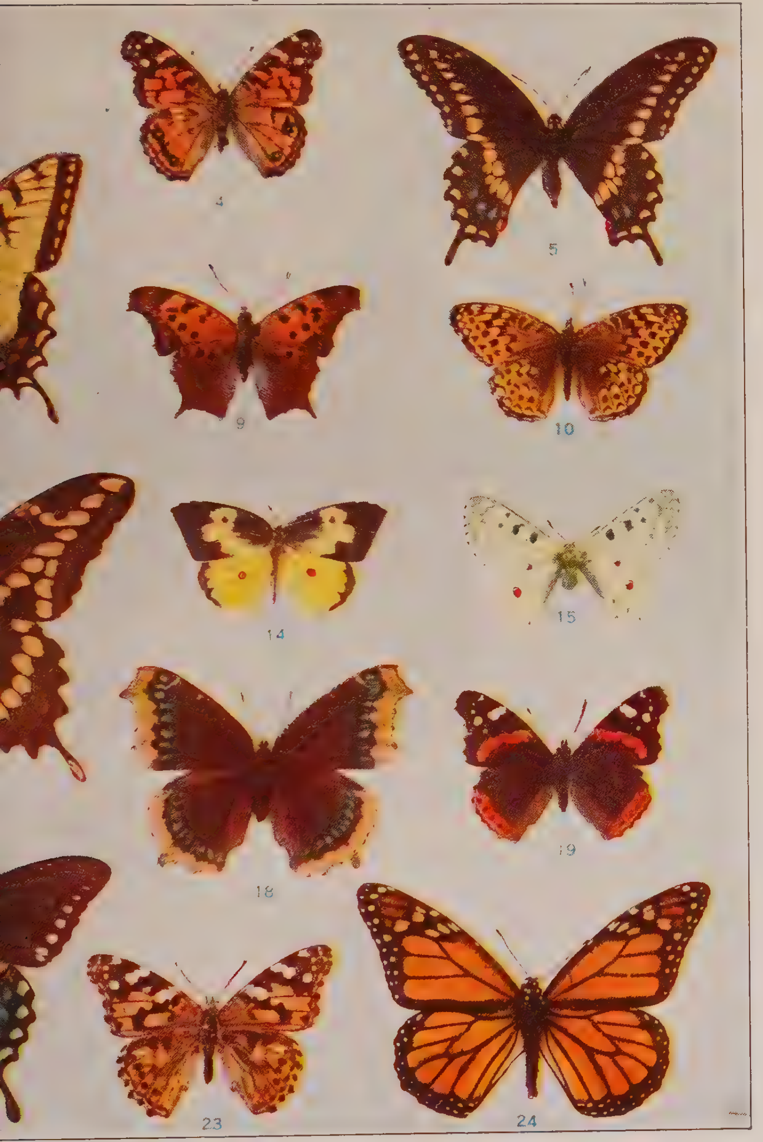
From Specimens in the American Museum of Natural History



surface is brown, with a row of seven orange-red spots and two reddish spots at base of fore-wing and four at base of the hind wing. The margin is black, with rows of bluish spots just within.

This is one of our most beautiful Butterflies, and covers the entire eastern half of the country as far west as the Rocky Mountains.

WHITE-BANDED PURPLE (*Basilarchia arthemis*). This beautiful Butterfly is easily recognized by the broad white band across the middle of the front and hind wings. The general color is a velvety purplish-black. The larva feeds on birch, willow, poplar, and other trees.

This is a northern species common in Canada and the Great Lakes Region and goes farther south in the mountains. I find it common in the Catskill Mountains, but is more plentiful some years than others.

There is a species on the Pacific Coast and extending as far east as Nebraska that is quite similar to the White-banded Purple, only the white band is wider. It is known as WEIDEMEYER'S ADMIRAL.

The VICEROY (*Basilarchia disippus*) is the best-known species of the genus. It extends over this country as far west as the Sierra Nevada Mountains, and a few have been taken on the Pacific Coast. The larva feeds upon willow and the various species of poplar. It is two- or three-brooded. The last brood has the hibernating instinct. The partially grown larva rolls itself up in a leaf which it attaches to the twig with silk and spends the winter in that condition. It does not awake to feed until the leaves appear again.

The Viceroy is remarkable for the way it resembles the Monarch. They have the same orange-brown or tawny-brown color. The margin and wing veins are bordered with black. The Viceroy differs in its smaller size and narrow black band across the hind wings. Of course, there are other minor differences. Specimens of each before me as I write have almost exactly the same shade of color. One year, the boys in camp where I have charge of the nature study collected fifty specimens of the Viceroy, and they could have gotten hundreds. The next year, the best they could do was to get only two specimens.

SWALLOWTAILS (*Papilio*)

The Butterflies belonging to this genus are generally large and beautifully colored and the hind wings end in tails. The larvæ are smooth and characterized by brightly colored, fleshy, horn-like scent organs, which can be drawn in or projected at will. These horns come from an opening in the first segment of the body. When not disturbed these horns are invisible, but gently touch the caterpillar and they are quickly pushed out and a disagreeable odor is evident. Without doubt this is to keep off ichneumon-flies and other enemies. The pupæ are fastened at the top and held or kept from swinging too much by a silken girdle around the middle.

The ZEBRA SWALLOWTAIL (*Papilio ajax*) is a common insect all through the South and as far north as Central New Jersey, Pennsylvania, Northern Ohio and west, or as far north as the papaw-tree grows, for the larva feeds upon it. This is one of our most beautiful Butterflies. Its wings spread nearly three and a half inches, and the tails on the hind wings are nearly an inch long. It winters in the pupa state, and the spring Butterflies are smaller and differ slightly in color from those of midsummer. Both the front and hind wings are crossed by alternating bands of black and greenish white. There is a red spot in the hind wings. This Butterfly has the habit of settling on the ground and sipping moisture from damp places. I have seen half a dozen at one spot along sunny roadsides.

The EURYMEDON BUTTERFLY is a very similar species, with wings a little larger and tails shorter. It is found from Colorado west to the Coast, and from Alaska to Mexico.

The TIGER SWALLOW-TAIL (*Papilio turnus*) is the beautiful large yellow Butterfly found over practically all of the United States. It is very abundant in the Ohio Valley, where, as a boy, I often chased it across the fields, the Butterfly sometimes flying, sometimes sailing, now high, now low, often far ahead, where it would alight on milkweed blossom or thistle-top until I came up with it, and then the chase would be continued. Occasionally I would sneak up to one while it was sucking nectar from the flowers and take it captive in my net. This Butterfly also has the habit of sipping moisture from damp places in the sunny road, and can be sometimes captured there. The wings of the male have a spread of from three to four inches, and the female from three and a half to five inches. The general color is yellow, with three or four bands or stripes across the front wings and one across each hind wing. The border of each wing is black, inclosing a row of yellow spots.

The larva of this Butterfly is striking in appearance. It is dark green, and on each side of the third segment is a greenish-yellow spot with a black border. In the center of this spot is a black dot. It gives the larva the appearance of having eyes, and they are often brought to me for identification. The larva makes a cradle out of a leaf, and there on a bed of silk it rests when not feeding.

In the South there is a black form of this insect. Some of the females are yellow and some are black, but the males are always of the yellow type.

The BLACK SWALLOW-TAIL, often called EASTERN SWALLOW-TAIL

(*Papilio asterias*), is found over the Eastern States and the Mississippi Valley, and probably exists farther west. Its larva is well known, because it feeds on parsley, parsnips, celery, fennel, and other umbelliferous plants. When a boy I often collected these caterpillars and fed them leaves of parsley and parsnips until they pupated, and the next summer secured the Butterflies, for they spend the winter in the pupa state.

The caterpillar is as beautiful as the Butterfly. It is green, with velvety black rings, spotted with yellow.

The Butterfly has black wings, with two rows of yellow spots. Between the rows of yellow spots on the back wings is a row of larger blue spots ending in a red one. The abdomen also has rows of yellow spots. In the Rocky Mountain region and the southwest there are two or three very similar species. Perhaps they are only sub-species or varieties of this one.

The GIANT SWALLOW-TAIL (*Papilio cresphontes*) is even larger than the Tiger Swallow-tail. It is brownish-black, with a double row of yellow spots. These spots are large, and viewed at a distance form yellow bands. The bases of the hind wings are yellow, and the end of the tail is also yellow. There is a red spot on the inner side of each hind wing.

This is a southern Butterfly that is gradually working north, and has even been taken in Canada. I have found it in northern New Jersey. It is becoming quite common in parts of Pennsylvania where thirty years ago it was not found at all.

It is very common in the South, especially about the orange groves of Florida. The larva feeds on the leaves of the orange and lemon trees, and from its very odd appearance is called the "Orange-puppy," or "Orange-dog." Farther north it feeds on prickly ash and hop-tree.

There are other Swallow-tails that we should not forget. The DAUNUS (*Papilio daunus*) is very similar to the Tiger Swallow-tail, only a little larger, and has two tails on its hind wings. It is found in the Rocky Mountains. Its life-history has not been very well worked out. The SPICE-BUSH BUTTERFLY (*Papilio troilus*) is common in the Mississippi Valley and Atlantic States. The larva feeds on spice-bush and sassafras. The Butterfly is large, greenish-black, and each front wing has a row of yellow dots near the margin. Each hind wing has a row of bluish-greenish dots near the margin and a similarly colored band across the middle. A red spot on each back wing also distinguishes the species.

The PIPE-VINE SWALLOW-TAIL is very similar to the last, but lacks the row of yellow dots on the front wings and the red spots on the back ones. There are others, but space forbids our mentioning them.

The Satyrs or Meadow-Browns

(*Satyrinæ*)

The Butterflies belonging to this group are generally brown, sometimes nearly black, with eye-like spots which are more prominent on the under side. Some of the veins of the fore-wings are greatly swollen. They are usually found in grassy places and open woods. Their flight is weak, and they are easily taken.

The Pearly Eye (*Debis portlandia*) is a common species from Maine to the Gulf and west to the Rocky Mountains. The wings have a spread of a little less than two inches. There are three dark spots on the upper side of the front wings and five on the back ones. The under side of back wings have beautiful eye-like spots. The general color of upper surface is a soft grayish-brown.

The Grass Nymph (*Satyrodes canthus*) is much the same size and color as the one just described. The front-wings have four black spots and the hind wings five or six. It is generally found in grassy fields and open woods, and has much the same range as the last species, except that it seems more northern.

The Common Wood-nymph (*Satyrus alope*) is found over nearly the entire country. Some of the western and northwestern forms are called varieties. Like the other Satyrs, the larva feeds on grass, and is active during the night, and rests or lies concealed by day. This Butterfly varies wonderfully. On the front wings are two black eye-like spots with blue centers. Surrounding these eye spots are rings or bands of yellow.

The Whites and Yellows

Family *Pieridæ*

The Butterflies of this family are the familiar whites and yellows of the field and roadside. Some are quite large, but the great majority are of average size, or a little smaller. The larvæ are generally green, sometimes striped.

The Cabbage Butterfly (*Pieris rapæ*), although only introduced from Europe in 1860, at Quebec, and in 1868 at New York, is now found from coast to coast. In fact, no cabbage patch, however small, escapes this undesirable visitor. It is the only Butterfly that seriously injures crops, but the loss to gardeners is estimated to run into millions of dollars a year.

The little green larvæ found on cabbage leaves are very familiar. There are usually three broods a year, winter being passed as a chrysalis from which the adult emerges early in the spring. These early Butterflies are smaller and less heavily marked than the ones which come later in the season. The upper surface of the wings is white. The female has two black spots in each fore-wing and the male but one. The tip of the front wings is also shaded dark. There is a single black spot near the front margin of each hind wing.

Our common old-fashioned CABBAGE BUTTERFLY (*Pieris napi*) has been driven out by the foreign one; and, as Lutz says, has literally taken to the woods and is seldom found elsewhere. The CHECKERED WHITE or SOUTHERN CABBAGE BUTTERFLY (*Pieris protodice*) is also decreasing as the foreigner increases.

The COMMON SULPHUR (*Colias philodice*) is the yellow Butterfly so common in clover fields, or in swarms at moist places in the sunny roads. I recall how I tried to capture them when a boy as they collected by dozens near a watering trough. They would fly up, scatter about, and return to the spot again. The under surface of the wings is sulphur-yellow, and the upper surface is greenish-yellow, with a black spot on each fore-wing and an orange spot on the hind wings. The front and back wings are bordered with brownish-black. In the female, this border has a row of yellow dots in the front wings. This Butterfly is also called the CLOUDED SULPHUR. The larva feeds on clover. It ranges from Canada to South Carolina and west to the Rockies. Very similar species are found in the far west and southwest. In fact, the majority of Butterflies belonging to this family are western.

The DOG'S HEAD (*Meganostoma cæsonia*) is a beautiful southern Butterfly, found from the Atlantic to the Pacific. The larva feeds on clover. The wings on the upper surface are bright yellow, with a wide border of black on the front ones, but the hind wings have a narrow border. The outline of the yellow on the front wings is shaped like the head of a dog with a black spot for an eye.

THE SKIPPERS

FAMILY *Hesperidæ*

THOSE Butterflies get their name from the low, jerky flight. They are generally small, with dark or dusky wings.

We will mention only one, the SILVER-SPOTTED SKIPPER (*Epargyreus tityrus*). The wings are a dark chocolate brown, with a row of yellow spots across the front ones; but the chief characteristic is the larger, irregular, silvery-white spot on the under side of each hind wing. The antennæ are hooked at the end. The smooth, yellowish-green larva has a large head, small neck, and feeds on the leaves of the locust tree and other legumes. This Butterfly ranges over almost the entire United States and on south to Panama.

The Silver-Spotted Skipper often attracted my attention as a boy. The quick, jerky flight and buzzing sound, produced by the opening and closing of its wings, fascinated me. Like most Butterflies, they have good eyes, and I had trouble in capturing them, but they never looked so attractive when caught as they did flying before me out of reach.

MOTHS

We now come to that great group of insects known as Moths. As there are over six thousand species of these in the United States, we will describe only a few of the more conspicuous ones.

I am writing these lines while seated in a shack at Camp Wake-Robin, in the heart of the Catskill Mountains. Moths and Butterflies are plentiful, and the boys collect many species of them. In the evening when we light the big lamp, the Moths often come to it by the dozens. The better specimens are caught and placed in killing bottles, and the next day are mounted to show off their wings to proper advantage. When the insects are dry they are placed in boxes with cotton background and glass tops, and are then hung on the walls for study and display and are to be taken home when camp closes. The wooden boxes are made in the workshop, and those of cardboard in the tent or shack. Above all, we try to teach the boys what an insect does and how it does it. As the work goes on and as their collections grow they become more enthusiastic, and many boys continue this line of nature study after they leave camp.

HAWK-MOTHS, OR SPHINX MOTHS

FAMILY *Sphingoidea*

The insects belonging to this family are called HAWK-MOTHS, or HUMMINGBIRD MOTHS, from their rapid, darting flight, long, narrow wings, and from their habit of remaining poised in air, for a short time, before flowers. The bodies are long and heavy, but the tail is pointed. The general color of both wings and body of many species is a soft mouse gray. They have flexible tongues, in some species nearly six inches long, which are straightened out when thrust into deep tubular flowers, but coiled like a watch spring when the insect is at rest. Most species fly in the twilight, and a few in the bright sunshine, but I have had some species come in to the lamps on dark, cloudy nights. Their eyes are large and very bright, and shine beautifully at night.

The larvæ are long, almost smooth, and are generally a pale green, sometimes brown, with oblique light lines on the side. The last segment usually has a horn, or in some species an eye-like spot, which makes them appear vicious, but they are really perfectly harmless. The larvæ have the habit of elevating the front part of the body and drawing in the head, and it is from this attitude that these insects get the name of "SPHINX." Generally, pupation takes place within the ground, but some species form rude cocoons with silk and leaves on the surface of the ground.

In camp we have collected at least fifteen species of these Moths, and they have always attracted much interest. They range from medium to large size, and it is often quite difficult to determine the exact species.

A few Moths have the greater part of the wings clear. These are called HUMMINGBIRD MOTHS, or CLEAR-WINGED SPHINXES. They are often mistaken for real humming-birds. They fly in the bright sunshine, and take nectar from many kinds of flowers. The most common Eastern species is the CLEARWING THISBE (*Hemaris thisbe*), and is found over nearly the entire section east of the Mississippi River. It is the largest of these Moths, and much resembles a hummingbird. The front part of the body is yellowish-green, then comes a band of brown, followed by yellowish-green with a brownish tuft on the tail. It varies some with the season.

The SNOWBERRY CLEARWING (*Hemaris diffinis*) is a smaller species. It is found west to the plains, and a variety of it is found from Colorado to California and north. The under side of the body is yellow and black, and the upper side greenish-yellow and black. When flying about the blossoms it very much resembles a big bumble-bee. The larva feeds on snowberry and allied plants.

Of the evening-flying Hawk-moths perhaps the best known is TOMATO-WORM SPHINX (*Phlegethontius carolina*). The larva is the common caterpillar that feeds on the leaves of the tomato-plant. It is large and green, with a long caudal horn. When full grown, it leaves the plant, and buries

TOMATO WORM—LARVA OF THE SPHINX MOTH

itself in the ground, where it changes to a dark-brown chrysalis, about two inches long, or a little longer, with a peculiar jug-handle on the one side. This jug-handle concern is a sheath or case for the tongue of the Moth. These queer pupæ are often plowed up in gardens, especially where tomatoes have been grown. The Moth is large and beautiful. Its wings expand about four and a half inches. The front ones are ashy-gray and the back ones banded light and dark. There are six orange-yellow dots on each side of the abdomen. There is another species (*P. celeus*) with the same habits and appearance. It is a little lighter in color, with five orange-yellow spots on each side of the abdomen. Both species feed on the tomato, tobacco, and other plants belonging to that family. The larvæ of each are called tobacco worms, or tomato worms, according to the plant they are found upon. Both range over this country and on south through Mexico and part of South America.

CHRYSALIS OF TOMATO-WORM SPHINX

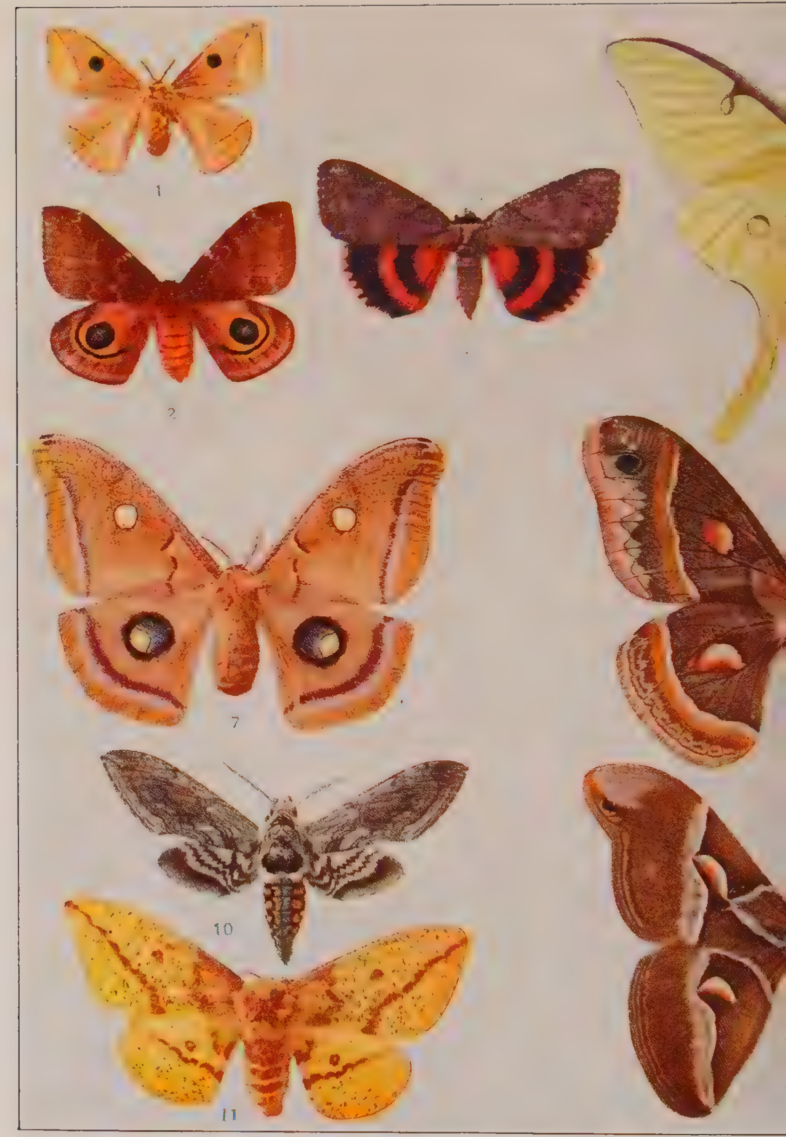
The Modest Sphinx (*Pachysphinx modesta*), often called the Large Poplar Sphinx, is probably the largest species to be found in this country. Every year we capture two or three specimens at camp in the Catskills. I have specimens before me that measure almost six inches across the wings. The body is heavy and mouse gray. The front wings are grayish-brown, lighter next the body, and the back wings are tinged with pink, with a dark spot near the angle. It ranges from the Atlantic to the Pacific, but the western form has lighter front wings and more rosy back ones. The larva feeds on poplar and willow, and pupates in the ground.

The Striped or White-lined Sphinx (*Deilephila lineata*) is a common species found over this entire country. It is especially common about Denver and the Rocky Mountain region. The larva feeds on purslane and other plants. The Moth has three whitish lines on each side of the thorax. There is a whitish line or band through the middle of each front wing from apex to base, and a broad reddish brown band in the middle of each hind wing. The larva varies greatly.

The Hog Sphinx (*Ampelophagus myron*) is interesting, not only because the Moth is beautiful, or because the larva forms a rude cocoon on the ground, or because it feeds on the leaves of the grapevine and Virginia Creeper, but chiefly because the larva is so often parasitized by Braconids, little ichneumon-flies, that deposit eggs beneath the skin of the caterpillar. The larvæ of the flies feed on the tissues of the caterpilllar until full grown and then come to the surface to form cocoons. Sometimes

MOTHS

1. Io Moth (male)
2. Io Moth (female)
3. Underwing
4. Luna Moth
5. Promethea Moth (male)
6. Promethea Moth (female)
7. Polyphemus Moth
8. Cecropia Moth
9. Erebus odora
10. Tomato Worm Moth
11. Imperial Moth
12. Cynthia Moth
13. Pandorus Sphinx
14 Royal Moth



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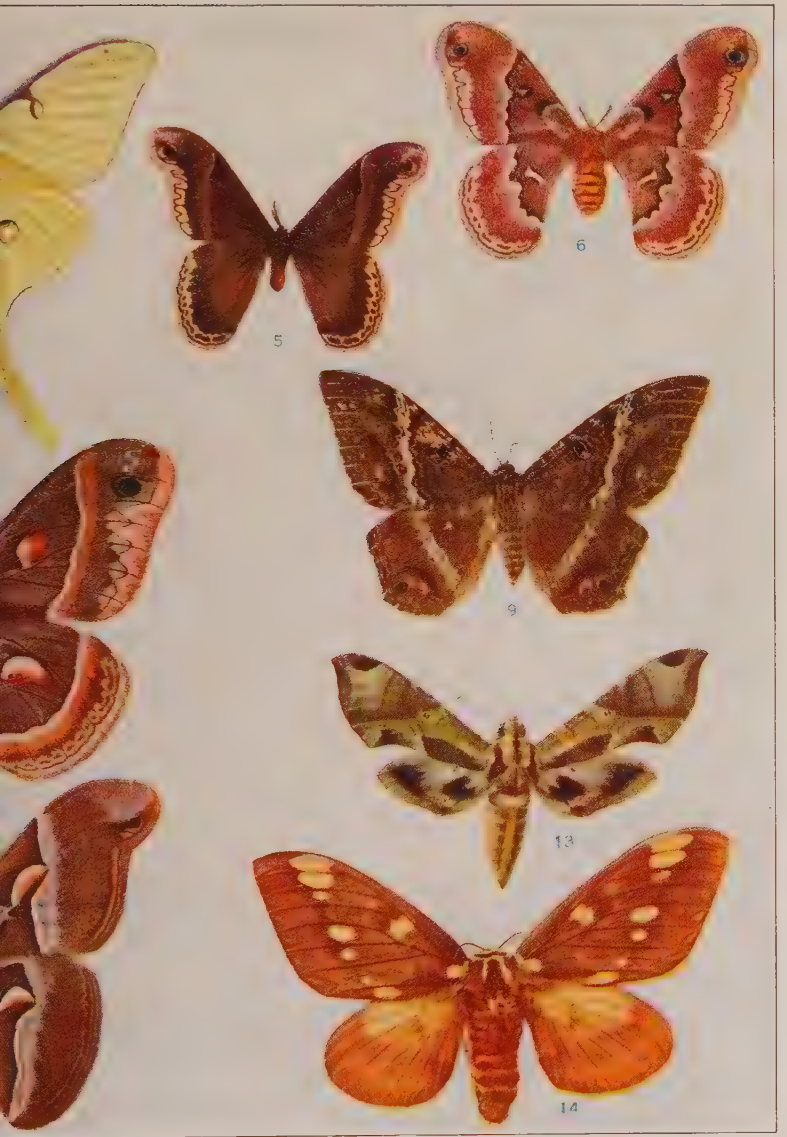
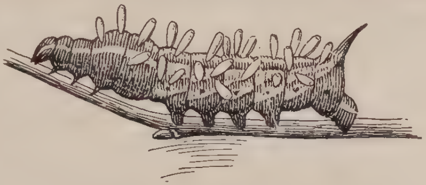
From Specimens in the American Museum of Natural History



ze)

the back of the caterpillar is covered with little white cocoons less than a quarter of an inch long. The larva of this Moth is not the only one attacked by these Braconids, but it seems to be the one most often affected by them. Last year I picked four large caterpillars from my tomato stalks and three of them were parasitized. Although they were still living, they would not be able to pupate.



CATERPILLAR OF HOG SPHINX
Bearing on its back cocoons of a parasitic insect

The Hog Sphinx gets its name from the "fancied resemblance of the larva to fat swine."

The Pandorus Sphinx is one of the most beautiful of all our Moths. It is found in the eastern half of the United States. The larva also feeds on the grapevine.

SILK-MOTHS

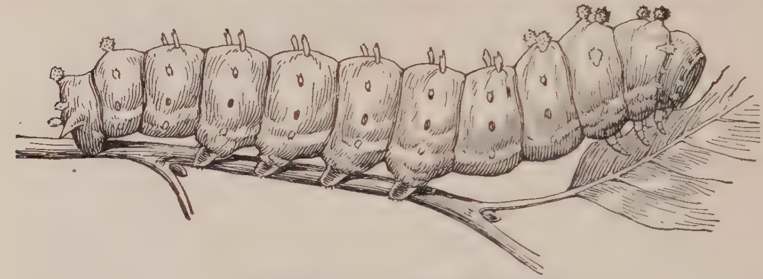
Family *Saturniidæ*

To this family belong the Moths that boys know best. Their large size, beautiful colorings, conspicuous caterpillars, and in many cases large, fluffy cocoons, cause them to be much sought after by collectors. The antennæ of the males are feathery and much larger than those of the females. The larvæ are great eaters, but they are generally not numerous enough to be troublesome. In many species the mouth-parts of the adult, or Moth, are so weak and imperfect that it would be practically impossible for them to take food.

Cynthia Silk-Moth (*Philosamia cynthia*) is a native of China and Japan, and was introduced into this country about 1861. The larva feeds on the Ailanthus tree, or Chinese Sumac, which was introduced into this country more than a hundred years ago. It is sometimes called the Ailanthus Moth.

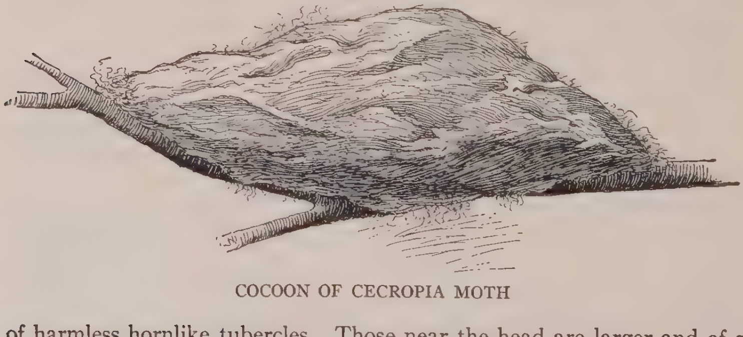
This is a large and very beautiful species. The wings are exceptionally large for the size of the body. The coloring is very difficult to describe, but in general it is olive brown and gray. The body has white tufted spots. The caterpillar is bluish-green, with black dots. The cocoon, made of very white silk, is rolled in a leaflet and fastened to the main leaf and often to the stem. A good grade of coarse silk has been made from it, and the Moth was introduced into this country for that purpose. The Cynthia is very common about some of our eastern seacoast cities; and since the Ailanthus has moved into the Mississippi Valley, we may expect the Cynthia to follow. I once came across hundreds of Cynthia cocoons in a thicket of Ailanthus near Jersey City.

Cecropia Moth (*Samia cecropia*) is also a common species from the great plains east. Two very similar species are found from the Rocky Mountains west to the Pacific. Some authorities consider them only varieties of the Cecropia. This is our largest Silk-moth. I have a specimen before me that has a wing spread of more than six inches. The general color is brownish-gray, with tinges of red here and there; a whitish band bordered without by brownish-red crosses near the middle of both front and hind wings. Each wing has a crescent spot between this band and the body.



CATERPILLAR OF CECROPIA MOTH

The larva of the Cecropia feeds on a great variety of trees and shrubs. It is nearly four inches long, bluish-green in color, and armed with rows of harmless hornlike tubercles. Those near the head are larger and of a bright red color. The others are yellow, except those of the first and last segment, which are blue. The smaller ones on the side are also blue. It is always interesting to watch one of these caterpillars spin its cocoon,



COCOON OF CECROPIA MOTH

This can be done by placing one of the larvæ in a box with some of its food. When full grown it will spin a cocoon in some corner or on a stick placed in the box for that purpose. In their natural habitat they generally place them on the under side of some branch or twig. They are most often observed when the leaves have fallen, and are sometimes eaten by downy woodpeckers and other winter birds.

Although I had collected dozens of cocoons of this species and obtained the Moths as they came out of them, yet I had never observed a Moth coming from the cocoon until a few weeks ago. When the larva spins the cocoon, it leaves an opening or valve at the one end and out of this the Moth pushed its head and antennæ, then after much squirming out came its wing pads, body, and legs. Crawling up to where it could hang back down it pumped blood into its wings until they expanded full size.

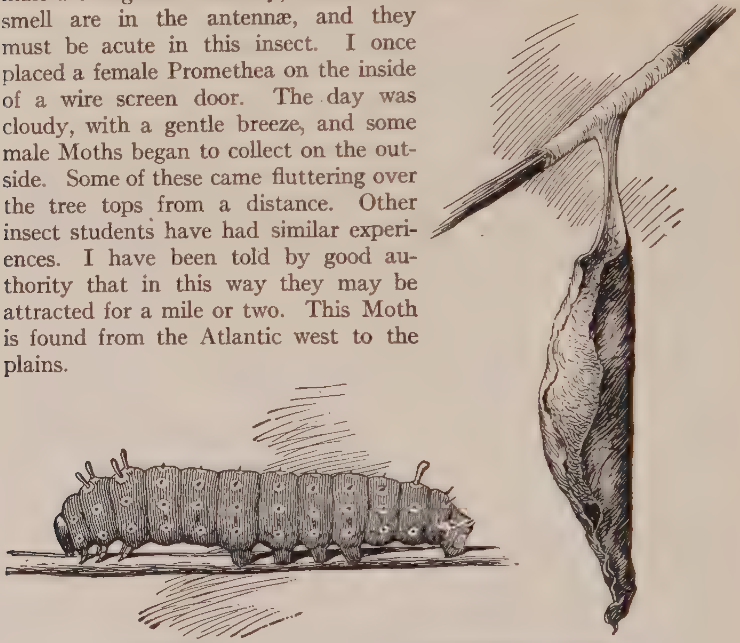
One of the best ways to get good Moths is to gather cocoons and keep them until the Moths appear. Those of Promethea and Cecropia can be found from the time the leaves fall until they unfold again the next spring. I generally obtain those of Polyphemus and Cynthia in the fall. If the cocoons are kept in a warm room, the Moths will appear early in the season. These Moths are often imperfect because the cocoons become too dry. They should be dipped in water, or sprinkled occasionally.

The Cecropia and other large silk-spinning Moths are generally more abundant near towns and cities than they are far out in the country. They are probably attracted by the lights. Two boys once collected for me more than a hundred and fifty cocoons of the Cecropia Moth near a large coke plant in the Connellsville Coke regions of Pennsylvania. I recently secured thirty-five cocoons of the Polyphemus Moth in one short walk within the limits of Jersey City, N. J.

The PROMETHEA MOTH (*Callosamia promethea*) is a very common species. Once after the leaves had fallen, my two boys and I collected two hundred cocoons of this Moth in two walks at Arlington, N. J. They were nearly all obtained from small wild-cherry and sweet-gum trees in vacant lots. The larvæ also feed on spice-bush and sassafras.

The caterpillar is bluish-green, with longitudinal rows of wart-like tubercles, which are shiny black. Two on each side next the head are bright red. The larva spins a cocoon rolled within a leaf, the petiole of which is tightly fastened to the twig with strong strands of silk. The leaf with the cocoon hangs on the tree all winter. An opening or valve is left at the top of the cocoon, and as the insect crawls out it clings to the twig until its wings are fully expanded.

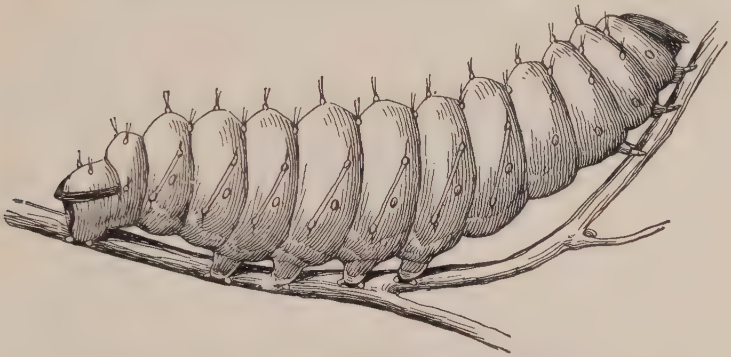
The female Promethea very much resembles the Cecropia, but the male is much darker with narrower front wings. The antennæ of the male are large and feathery, those of the female narrow. The organs of smell are in the antennæ, and they must be acute in this insect. I once placed a female Promethea on the inside of a wire screen door. The day was cloudy, with a gentle breeze, and some male Moths began to collect on the outside. Some of these came fluttering over the tree tops from a distance. Other insect students have had similar experiences. I have been told by good authority that in this way they may be attracted for a mile or two. This Moth is found from the Atlantic west to the plains.



CATERPILLAR AND COCOON OF PROMETHEA MOTH

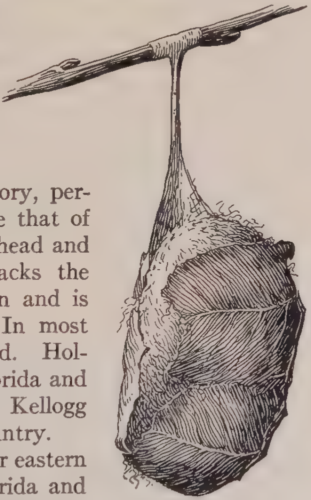
The Polyphemus Moth (*Telea polyphemus*) is nearly as large as the Cecropia. Its general color is brown, with a clear eye-like spot in front and hind wings—an unmistakable characteristic. The window spots in the hind wings are surrounded by an oblong dark blotch, bluish on the inner side next to the clear spot. The color of this Moth varies greatly in different specimens. I have two males before me as I write, and one is light brown and the other much darker. The larva is large, thick, light green, with seven oblique yellowish lines on each side. The numerous black wart-like prominences have stiff bristles. It feeds on a variety of trees, but I have found it most common on chestnut and birch. The dense oval cocoon is rolled in leaves, but unlike that of the Promethea it does not remain on the tree, although it often hangs for some time by loose silken threads. This Moth is found from the Atlantic to the Pacific.

The Luna Moth, or Pale Empress of the Night (*Actias luna*), is a favorite with collectors. It is a delicate light green, with a purplish band on the front margin of the fore-wings. There is an eye-like spot, with a clear center near the middle of each front and hind wing. The hind wings have long tails. Two specimens that we captured in the Catskill Mountains have tails one and three-fourth inches long. Many people consider this our most beautiful American insect, but if exposed to too much light the color fades.



CATERPILLAR OF POLYPHEMUS MOTH

The caterpillar feeds on walnut, hickory, persimmon and other trees. It is much like that of the Polyphemus, but has a pearl-colored head and a pale-yellow line on each side, but lacks the seven oblique lines. The cocoon is thin and is made between leaves on the ground. In most parts of the country it is double-brooded. Holland says it is found from Canada to Florida and west to Texas and the great plains, but Kellogg remarks that it ranges over the whole country.



COCOON OF POLYPHEMUS MOTH

The Io Moth (*Automeris io*) is a familiar eastern species. It is found from Maine to Florida and west to Texas. Similar species are found in New Mexico and Arizona. The larva is green, with a pink stripe on each side, bordered below with white, and covered with tufts of branching spines, the prick of which is poisonous to the touch.

causing pain and often swelling. Yet my two boys, aged nine and eleven, once came back from a walk with their coat pockets filled with these caterpillars. How they managed to get them in their pockets I do not know, but they said it was the only way they could carry them. The coats were spread on the floor, and as the caterpillars crawled out they were placed in a large box and fed on their natural food, a variety of trees and shrubs. There were about forty in all, and in a few days they pupated, forming compact, brown cocoons rolled in leaves at the bottom of the box.

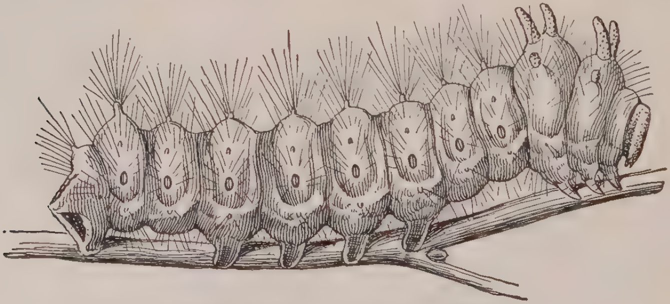
LARVA OF IO MOTH

This is a very beautiful Moth. The fore-wings of the female are a rich purplish-brown, while those of the male are a bright yellow. The hind wings have a large blue and black eye-spot in the center, and the coloring is much alike in both sexes. The female is larger than the male. These insects must be handled carefully, or the scales will come off and the beautiful coloring be destroyed.

THE ROYAL MOTHS

FAMILY *Ceratocampidæ*

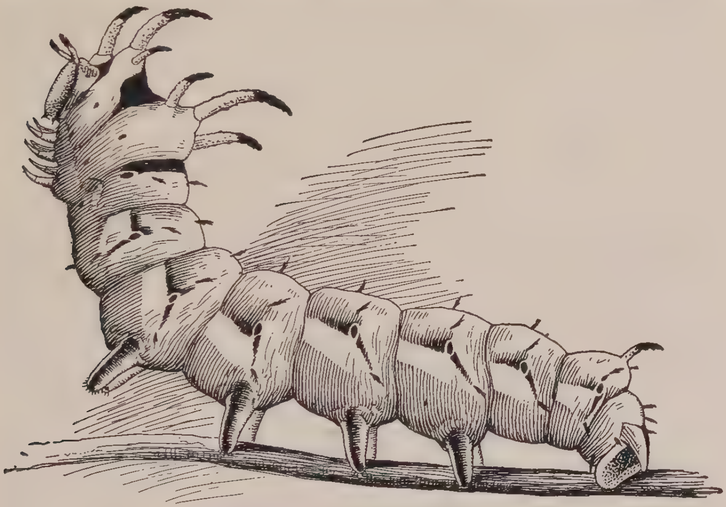
THE bodies of these Moths are rather short and heavy. Pupation takes place in the ground. No cocoon is formed.



CATERPILLAR OF IMPERIAL MOTH

The Imperial Moth (*Basilona imperialis*) is one of our most beautiful species. The larva is three inches long, and is clothed with thin but quite long hairs. The color varies from green to brown. There are spiny horns on the second and third thoracic segments. It feeds on the leaves of hickory, maple, oak, and other trees, including some conifers. The general color of the Moth is a rich yellow, blotched and marked with pink purple. The male is darker and has more of the purple. The wings have a spread of about five inches.

The Royal Moth (*Citheronia regalis*) is a beautiful Moth about the same size as the Imperial, but it is generally quite rare, however it or its remarkable larva is occasionally found. Its body and hind wings are a rich brown. The fore-wings are a brownish-gray, with reddish-brown along the wing-veins. The fore-wings are blotched with yellow. The caterpillar is called the Hickory Horned Devil. It feeds on hickory, walnut, butternut, and other forest trees. It is our largest caterpillar, measuring nearly five inches long. It is greenish or brownish in color, with reddish horns, tipped with black. Some of these horns are more than an inch long, but they are perfectly harmless. When a boy, I found one of these larvæ at a picnic in the woods. I was warned on every hand "to beware of its poisonous sting," and the women begged of me "to destroy such a horrid creature," but in spite of their pleadings I took it home,



HICKORY HORNED DEVIL

placed it in a box with some food and several inches of ground at the bottom, but for some reason or other it failed to pupate.

The ROSY MAPLE-MOTH (*Anisota rubicunda*) is a delicate and beautiful little creature. The wings are yellow, banded with rosy red. The coloring varies greatly. The female is about two inches across the wings. The larva is called the Green-striped Mapleworm. When full grown it measures nearly two inches long. The stripes are yellow green and deep green alternating. There are two horns on the second segment. It is found through eastern United States west to the great plains and is sometimes a serious pest.

There are two other species of *Anisota* that are of interest. They are *Anisota stigma*, or the STIGMA MOTH, and *Anisota virginiensis*, the VIRGINIA ANISOTA. The larva of the former is called the Spiny Oak-worm, and that of the latter the Rosy-striped Oak-worm. The Moths are much alike, a little larger than the Rosy Maple-moth and brick red in color.

BUCK MOTH, SHEEP MOTH, ETC.

FAMILY *Hemileucidæ*

THIS family includes the MAIA MOTH (*Hemileuca maia*). It is often termed the BUCK MOTH, because it flies at the time of year that hunters stalk the deer. The general color of the wings is black, with a white band across the middle of each wing. Very similar species are found in the Southwest. It is found from Maine to Florida and on west to the plains. The larva is brownish-black, with a lateral yellow stripe. Each segment has large branching spines. This Moth has the peculiar habit of flying during the day and early twilight.

There also belongs to this family, the SHEEP MOTH, or CLOWN (*Pseudohazis eglanterina*). It is a striking Moth of the Rocky Mountain region. The general color of the wings is purplish-red, spotted and striped with black. It is shaped like the Maia, but is a little larger. A similar species is found in the Sierra Nevada Mountains and on the Pacific Coast. Also, a kindred sort, but with white wings, banded with black, is found in the region of the Great Basin.

The large Moths are the ones that attract most attention, but some of the smaller species are just as interesting. We will describe a few typical species.

CTENUCHAS MOTHS

FAMILY *Syntomidæ*

THOSE who have collected Butterflies in the bright sunshine could scarcely have failed to notice the CTENUCHAS MOTHS, with blackish-brown wings and blue bodies. They do not fly high in air, but low among the weeds and grasses. I recently photographed one sucking nectar from the blossoms of the milkweed. It flew from one cluster of flowers to another. The common eastern species is *Ctenucha virginica*. During July they often come to the lights in my shack at night, so I know that they are both day and night flyers. The front wings are dark brown and the hind ones nearly black. They have an orange-red head, and the body is deep blue A specimen before me measures nearly two inches across the wings. Pacific coast species, *C. multiforia* and *C. ruberoscapus*, have coral-red heads and shoulder-lappets. Some other species have whitish lines through the fore-wings.

THE TIGER-MOTHS

FAMILY *Arctiidæ*

This is a family of many species. The adults are called TIGER-MOTHS, from their bright stripes and peculiar markings. The larvæ are called "woolly bears," from their rough, shaggy coats of coarse stiff hairs. The Moths are of medium to small size and are stoutly built. The larvæ feed on a great variety of plants and weeds, and are often found on plantain and beggar-ticks (*Bidens*). The fall web worm feeds on the leaves of fruit and shade trees and makes webs covering leaves and twigs. The larvæ form cocoons of silk, combined with the hairy covering of their bodies. Caterpillars should be handled carefully, for sometimes the stiff hairs get under the skin and break off, thus forming a nettle-like rash. We once had two boys in camp who were rearing and studying caterpillars. Their arms became affected with a peculiar itching rash which puzzled us for some time. Suspecting the cause, the boys were induced to handle the caterpillars carefully, and the itching and blotches soon left.

The beautiful little BELLA MOTH (*Utetheisa bella*) is common over the Atlantic States. Kellogg's description of it is good. It has "pinkish-red hind wings, with black branching border and yellowish-red fore-wings, crossed by six bending white bands containing small black spots." I generally find it on goldenrod in August and September. Sometimes it is concealed in the blossoms of the Evening primrose. A little yellow spider also conceals itself in the Evening primrose blossoms and grabs this and other Moths as they come to the blossoms.

One of our most common Caterpillars is the larva of the ISABELLA MOTH (*Isia isabella*), found over this entire country. The larva is called the "woolly bear," and it is the wooliest of them all. It is covered with short stiff fur, almost bristles, and is black at each end and brown in the middle. Its head is black, and it travels rapidly with an undulating motion. In late autumn it hunts a cozy, protected place and curls up, hibernating until spring. When warm weather arrives and vegetation reappears, it then comes forth, eats for a week or two, then pupates, forming a crude cocoon, made of the stiff hairs from its body, bound together with silk.

The Moth has a spread of about two inches. The front wings are grayish-orange, with fine black spots. The hind wings are brighter with reddish tinge, and also spotted with black. The orange body has a row of six black dots on top of the abdomen, and also a row on each side. It sometimes comes to the light at night.

A very common species is the VIRGIN TIGER-MOTH (*Apantesis virgo*). It is really a very beautiful Moth. The fore-wings are velvety black and broadly veined with yellow. The hind wings are orange-red, with a number of large, irregular black spots. The thorax is colored like the fore-wings, with three black stripes. The abdomen is red, spotted with black. The larva feeds on pigweed, plantain, and other uncultivated weeds. This Moth seems more abundant in mountainous regions. On the evening of July 10, 1921, six fine specimens came to the lights in our camp in the Catskill Mountains. Although this Tiger-moth is an eastern species, other similarly marked species are found in the west and on the Pacific coast.

WOOD-NYMPH MOTHS

FAMILY *Agaristidæ*

THIS family is not a large one, but the Moths are rather brightly colored; generally black and white or red-banded. The Moths usually fly during the day, but some species come to lights at night.

The EIGHT-SPOTTED FORESTER (*Alypia octomaculata*) is an example. A few weeks ago while walking along the street I picked a fine specimen of this insect from the sidewalk. But they are not rare. Every year I find this Moth and the larva, which feeds on the leaves of the grapevine, Virginia Creeper, and ivy. The Moth is velvety black, with two yellow spots on each front wing and two white spots on each hind one. The caterpillar when full grown is about one and a half inches long, white, with cross lines of black and orange. It pupates at or just beneath the surface of the ground. It is double-brooded, the Moths generally appearing in May or June and August. This Moth is common all through the East. Similar species are found in the West. The CALIFORNIA FORESTER is a handsome species of the Pacific coast.

THE OWLET MOTHS

FAMILY *Noctuidæ*

THIS is a very large family of plump-bodied Moths, that fly almost entirely by night, hence their common name. Their eyes often glow like coals of fire. Their colors are generally dull, and blend well with the bark of trees where these insects often rest during the day. The larva, known as "cut-worms," familiar to country and suburban boys, belong to this family. They get their name from the habit of eating off young corn and garden vegetables just at the surface of the ground.

The PEARLY WOOD-NYMPH (*Euthisanotia unio*) is now placed under this family, but formerly was put in the regular wood-nymph family. It is a beautiful little Moth, whose front wings are creamy white, with a marginal stripe or band of brownish-purple. The hind wings are pale brownish-yellow, with a band of brown on the outer margin. The BEAUTIFUL WOOD-NYMPH (*Euthisanotia grata*) is colored almost exactly the same as the one just described, only it is larger. It has a wing spread of about one and three-fourth inches. Comstock says: "This Moth well deserves the popular name that has been applied to it." Both species come to the lights in our camp in the Catskill Mountains. They have practically the same range, and are common in Eastern United States as far west as the Mississippi River.

This is our largest family of Moths, containing about 2,100 North American species. Therefore, we can scarcely more than mention them. Many species are attracted to the lights, and others may be caught by the sugaring process. Perhaps I had better describe this method of attracting Moths.

Take a pound or two of cheap brown sugar and dissolve it in a little stale beer or other liquid—water will do in this late age. Then with a brush or cloth apply the solution to the trunks of trees. Trees growing along the border of woodlands or in isolated groves are generally best suited for this purpose. A good time to apply the liquid is in the evening just before dark. Then as night comes on take a lantern or flash-light and cyanide bottle and go the round of the trees. It is often well to take an insect net with you, for Hawk-moths frequently visit the spot to suck the sweets. As you go from tree to tree, the Moths will be sucking the syrup, and you can generally place the cyanide jar over them. A few drops of chloroform placed in the cyanide jar will put them to sleep more quickly. My experiments with this method is that in regions where the nights are warm it is much more of a success than in mountainous sections where the nights are cool.

Perhaps the most beautiful and interesting of the Noctuids are the CATOCALAS, or UNDERWINGS. This is a large genus, having at least a hundred species in this country. They are well distributed over the entire area, and many species have a wide range. The fore-wings are generally grayish or brownish, with zigzag lines crossing them. The hind wings are brilliantly colored, black, with broad bands of red, yellow, or white. They are quite large Moths, many species being three inches or more across the wings. When at rest the front wings cover the hind ones, and they blend so well with the bark of trees that it is very difficult to discover them. When sugaring for Moths, the Underwings are very apt to be attracted, and it is one of the very best ways of getting these insects. It is a good plan to go by the place the next day, for Catocalas often rest against the trunks of trees near where the syrup was painted on. Even if no Moths are found, Butterflies like the Mourning Cloak are apt to come to get their share.

A very common species, the ULTRONIA UNDERWING (*Catocala ultronia*), is found from Canada to Florida and west to the Great Plains. It is not as large as some others. The fore-wings are quite dark near the apex. The hind wings have the usual red and black bands. The larva feeds on oak, dogwood, apple, plum, and other trees.

One summer evening, at Arlington, N. J., while sugaring for Moths with a group of boys, we were making our last round among the trees, and on turning our spot-lights on the trunk of a red maple where syrup had been daubed, our hearts fairly jumped to see a great dark Moth sipping at the sweets. We succeeded in capturing it, and it proved to be the BLACK WITCH (*Erebus odora*), a native of the tropics, and common in southern Florida and the region along the Gulf. It is a strong flier and is sometimes swept north by the wind, and has been found even in Canada and Colorado. It is nearly six inches across the wings, which are brownish-black, crossed by a lighter band near the middle.

TOOTHBACKS

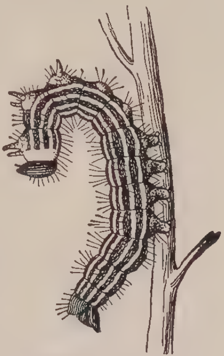
FAMILY *Notodontidæ*

MOTHS belonging to this family closely resemble the Noctuids. The Moths are of moderate size. They come to lights, and are also caught by sugaring. The larvæ have no clasping prolegs on the tail, therefore when at rest many species have both head and tail elevated. The larvæ of some species live in colonies.

A very common insect belonging to this family is the HANDMAID MOTH (*Datana ministra*). The larva is generally referred to as the

Yellow-necked Apple Worm. As Lutz says: "When at rest or when disturbed it seems to be trying to touch its tail with its head." The larvæ feed in colonies, often dozens on one little branch. The body is slightly hairy, is reddish or black, with pale yellow stripes, and it has a yellow neck, hence the name. The Moth has a wing spread of nearly two inches. The fore-wings are brown, crossed by bands of deeper brown. The hind wings are almost uniform light brown.

Another familiar species of this genus is the Walnut Hand-maid Moth (*Datana integerrima*). The dark colored larvæ have fine white hairs, and when ready to pupate, go down on the trunk of the tree, often by the thousands, and molt there, then pass to the ground to pupate.



YELLOW-NECKED APPLE WORM

THE MEASURING-WORMS

Family *Geometridæ*

This is a large family of small or medium-sized Moths, over eight hundred species existing in the United States. They are characterized by having slender bodies and large wing surfaces. When at rest they usually spread the wings out flat. The caterpillars are called "Measuring-worms," "Loopers" or "Inch-worms." They walk by making a loop of the body, that is the back is arched and the rear of the insect is brought up to just back of the head. It is then clasped to the twig and the head end stretched out and the process is repeated. In that way with each loop it moves forward nearly its own length. There is considerable superstition connected with these caterpillars. When I was a little boy, one day an old lady stopped at our house for a rest. As she sat on the veranda, I espied a Measuring-worm crawling over her dress. I ran to pick it off, but when she saw what I was about to do, she stopped me, saying that it was measuring her for a new dress which fate would bring her, and she didn't want me to disturb it.

In some species, the larvæ are colored green and in others brown. Some resemble twigs and have the habit of standing out at full length like a spur. There is a brown species that infests pear trees which so resembles the pear twig in color and appearance that it is very difficult to find even when it is right before you. It even has what looks like buds and rings of growth.

While these caterpillars are familiar to boys, they do not often observe the Moths. One common species that visits our lamps in camp and attracts the attention of the boys is called the SAW-WING (*Euchlæna serrata*). The wings are pale yellowish-brown, with the outer third a dark brown. Like many Moths belonging to this family, the front and hind wings are colored very nearly alike. The larva feeds on maple and apple.

SLUG-CATERPILLAR MOTHS

FAMILY *Limacodidæ*

THE Moths of this family are medium or small size, with short bodies and thick wings. The larvæ are almost slug-like in character, and are often covered with irritating spines.

A common species is the SADDLE-BACK larva (*Sibine stimulea*). This Caterpillar is familiar to most boys, and should be to all in the region where it lives, from New York to Illinois and south. The larva is less than an inch long, with spiny horns at both ends. In the middle of the back is a purplish-brown spot, the saddle. Surrounding this is the green saddle-cloth. On the horns and over the body are clusters of stiff, sharp-pointed spines, which break off easily. When imbedded in the flesh they often produce painful inflammation and swelling. Dr. Holland says: "Nettles are not to be compared in stinging power to the armament of this beautifully colored larva." It often feeds on corn, and many a boy in passing through cornfields has felt the sting of this insect on his neck, as I have.

The Moth has a brown body and dark brown fore-wings. The hind wings are a lighter shade of brown.

There are many other interesting Moths, but we must stop somewhere. I am writing these lines in a shack in the Catskill Mountains. Out of doors a heavy rain is pouring. On the wall back of my lamp are eleven species of Moths that have entered during the last hour. They are small but interesting and beautiful, and yet not one have I described in these pages. It would take volumes to describe all the Moths we find in this great country. We have endeavored, however, to introduce you to the more conspicuous species that you are apt to come across.*

FLIES AND MOSQUITOES

ORDER *Diptera*

INSECTS belonging to this order have only two wings. The mouth parts are for sucking, and the matamorphosis is complete.

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* Read "Gathering Cocoons and Chrysalises," "The Collection and Preservation of Insects," and "A Moth Trap and Spreading Board," all of which will be found in "Pets, Hobbies, and Collections."

The word Diptera comes from the Greek, meaning two wings. This single pair of wings is the best characteristic to distinguish Flies, Mosquitoes and other Diptera from insects belonging to other orders. In place of hind wings these insects have a pair of knobbed threads, the halteres. They are sometimes called balancers. Their use was not known until recently. When Flies are caught and both balancers removed, they can fly about, but cannot control their flight, and would go into danger as readily as away from it. If only one balancer is removed, they can still control their flight. In that respect, the balancers have the same use as the semi-circular canals in the human ear.

While the mouth parts are for sucking, in some cases they are also used for piercing. The larvæ of Flies are called Maggots. They have no feet; some have a distinct head and some have not. Some have naked pupæ; others have them inclosed in the last larval skin. A few form cocoons.

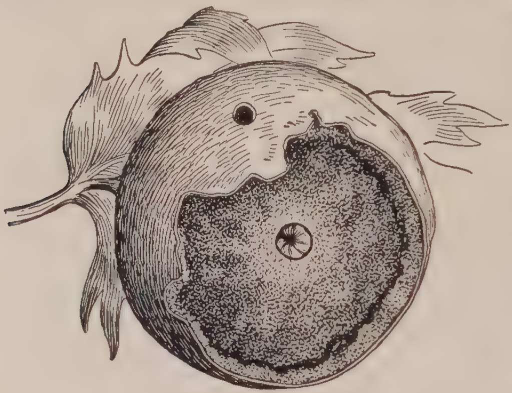
This is a large order and an important one, yet our attention is attracted to but few species. House-flies and Mosquitoes are discussed in "Woodcraft and Camping," so we will pass them by.

Some Flies are large and others small, so small in fact that they are scarcely visible. Most boys who have camped in mountainous regions are familiar with the little midges known as PUNKIES. The Indians call them "No-see-ums." Yet these tiny Flies, much smaller than a pin head, are very annoying. Their bites are not only painful, but often produce swelling and irritation. I have slept out many nights in the mountains, when just at day-break they would be so abundant as to make sleep and rest impossible.

The CRANE-FLIES belong to the family *Tipulidæ*. They are big, long-necked, long-legged Flies that in appearance much resemble overgrown Mosquitoes. The wings are rather narrow and the body long and slender. The legs are very long and thin, and so loosely attached that they are apt to break or come off in capturing them. A distinguishing characteristic is a V-shaped mark on the top-side of the thorax. The larvæ of most species live just below the surface of the ground and feed on the roots of grass and other plants. The adult Crane-flies are seen in summer, and are most common about pasture lands. They occasionally get into houses, and may be seen against the windows in their effort to get out. I have a fine specimen before me that was caught in that way. It is known to insect men as *Pedicia albivitta*, and is common in the Catskill Mountains. Its wings are whitish, crossed by brownish bands. The largest Crane-flies live in California. One species has a wing spread of more than three inches. These insects do not bite. They are sometimes taken for Mosquitoes, and in the evening we may occasionally see swarms or clouds of small species dancing up and down in the air.

INSECT-GALLS

The Galls formed by insects are always interesting. Some are produced by the larvæ of little two-winged Flies, and others by small Gall-wasps. Of those produced by Flies I am asked most questions about the Pine-cone Willow-gall (*Rhabdophaga strobiloides*). They occur on the tips of the willow twigs, and sometimes dozens are found on one bush. The eggs are laid on the terminal buds, just as they are opening in the spring. The larva probably secretes a fluid which checks the growth of the twig and causes the bud to be deformed and enlarged. I have just opened one of these galls that measures an inch and a quarter in diameter. A small white grub is at the center. The larva remains in the gall all through the winter, and early in the spring forms a pupa. The little fly appears just as the buds are bursting in the spring.



CYNIPS SPONGITICA
(Gall)

HORSE-FLIES

Family *Tabanidæ*

These insects are called Gad-flies, Deer-flies, Ear-flies, etc. They have broad heads and very large eyes. The females puncture the skins of animals, and are often very troublesome to live-stock. The males do not bite. In this respect they are like Mosquitoes, for we must remember that it is only the female Mosquito that bites. The male Horse-flies live on the nectar of plants. The larvæ live in water or moist earth, and are carnivorous.

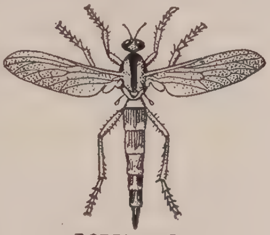
The Mourning Horse-fly (*Tabanus atratus*) is a common species, and has a wide distribution; in fact, it is found over a large part of this country. Boys refer to it as the Big Horse-fly. It is an inch or more long, of a uniform black color, with the body sometimes of a bluish tinge.

An even larger species is found in the Southern States. Small Horse-flies with banded wings belong to the genus *Chrysops*. They are very troublesome in woods, and attack the ears of horses, but do not confine themselves to those organs.

ROBBER-FLIES

FAMILY *Asilidæ*

FLIES belonging to this family have rather large heads, strong hairy bodies, which are long and generally taper to a point, long hairy legs, and a strong beak adapted for piercing and sucking. The wings are long and narrow, fitted for swift flight. These are hawks of the insect world, which pounce upon their prey, and holding it securely carry it away. Fitch says: "These Flies are inhuman murderers. They are savages of the insect world, putting their captives to death with merciless cruelty." The majority of the insects caught are captured on the wing, and they include Bees, Flies, Moths, Grasshoppers, and even numbers of their own species, for they are true cannibals.



ROBBER-FLY

With their long, powerful legs densely clothed with spines, they fasten a "body scissors" on their victim, or rather several of them, for all three pairs of legs are adapted for holding. While carrying it off, the robber thrusts its powerful beak into the victim and sucks its blood. Howard says: "The tip of the beak is bearded with stiff bristles, which hold it securely in the wound into which it is crowded."

There are many species of these Flies, and while they do some good in destroying noxious insects, they also do harm in capturing useful ones.

SYRPHUS-FLIES

FAMILY *Syrphidæ*

THIS is a large family, including many common species. They are often called FLOWER-FLIES, because they are so frequently found about flowers, and feed upon the nectar and pollen. They vary wonderfully in size and appearance. Some resemble Bees, and others look like Wasps. Certain species have the habit of remaining motionless in air, except for their wings, then suddenly dart a few feet away and repeat the hovering. The larvæ of some live on plant-lice or other small insects, and others feed on filth.

DRONE-FLY

The DRONE-FLY (*Eristalis tenax*) looks and acts so much like a Honey-bee that most people are afraid of it. Late in the fall they are often found on the inside of windows. I once saw two of them buzzing at a window when a trained biologist spoke of them as Bees, and warned the boys to beware of their sting. Had he looked closer he would have discovered that they had but two wings, while all Bees have four. The larvæ are called Rat-tailed Maggots. They have a long tube on the end of the body through which they breathe when under water. They live in filthy water. This insect is widely distributed.

THE BOT-FLIES

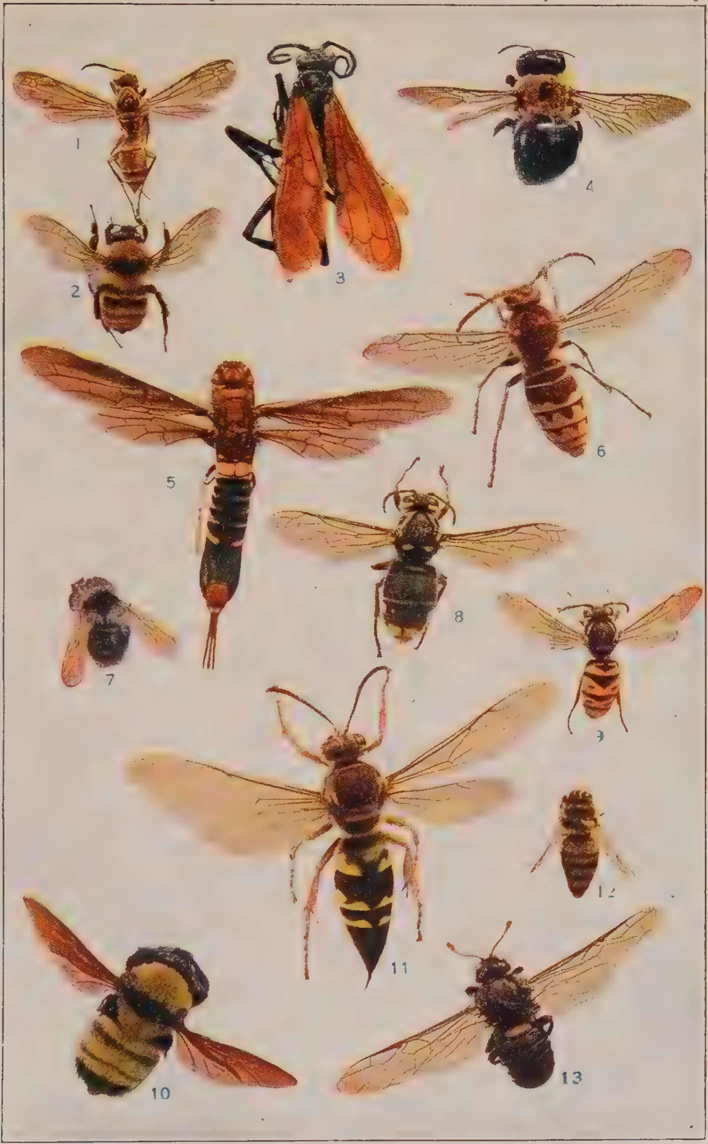
FAMILY *Oestridæ*

THIS is not a large family, but an important one, because the members are parasitic on animals, causing much suffering and sometimes death.

The HORSE BOT-FLY (*Gastrophilus equi*) is familiar to almost every country boy, and, in fact, to almost every person who has had much to do with horses. The Flies resemble Honey-bees, except that they are a little larger and more hairy. Horses have an instinctive dread of them, although they do not bite, probably cannot bite, for the mouth parts are not well developed. The light yellow eggs, often called "nits," are attached to the hairs of the legs, or sides of a horse. They are licked off and hatch into larvæ in the throat or stomach. The larvæ fasten themselves to the lining of the stomach and intestines, and there complete their growth. Often large areas of a horse's stomach are covered with these larvæ. When they have completed their growth, which is early the next summer, they let go and pass out with the indigestible material, and work their way into the ground for an inch or two and pupate. About a month later the mature Flies appear.

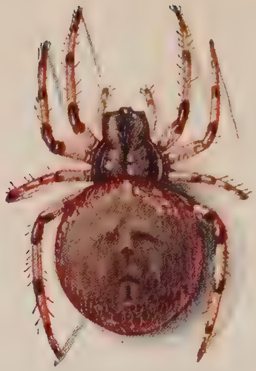
The OX-WARBLE (*Hypoderma lineata*), is called "HEEL-FLY" in the Southwest, because the eggs are generally placed on the cows' legs just above the hoof. They are licked off and hatch in the throat or stomach; from there they gradually work their way through the tissues, until a few months later they appear just under the skin and are then known to stockmen as Grubs. Each bores a hole through the skin and when fully developed drops to the ground, pupates, and in a few weeks changes to the mature Fly. When numerous, the hides of cattle are full of holes, and are greatly reduced in value. It has been estimated that the loss from these insects amounts to $50,000,000 annually.

From Specimens in the American Museum of Natural History

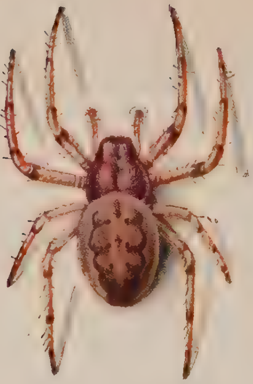


1—Common Brown Wasp
2—Boiling Bumble-bee
3—Tarantula Killer
4—Carpenter Bee
5—Pigeon Tremex
6—Large European Wasp
7—Cuckoo Bee
8—White Faced Hornet
9—Yellow Jacket
10—Bumble-bee
11—Digger Wasp
12—Horse Bob Fly
13—Saw Fly

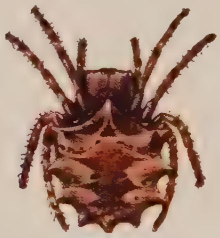
All natural size



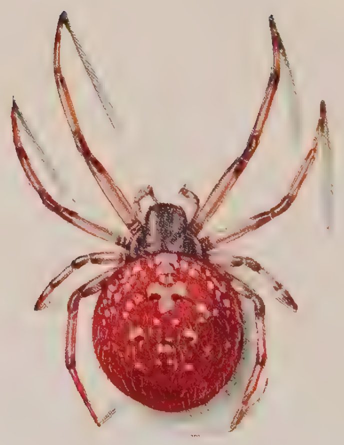
SHAMROCK SPIDER



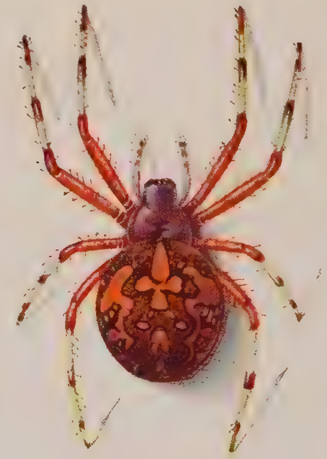
FOLIATE SPIDER



STELLATE SPIDER



SHAMROCK SPIDER



ARANEUS MARMOREUS

(All ½ natural size)

The SHEEP BOT-FLY (*Oestrus ovis*) lays its eggs in the nostrils of the sheep. The larvæ live in the nasal and other head passages of the sheep. They are said to even penetrate into the horns when they are present. They cause in the sheep a disease known as "staggers." When grown, they pass out through the nostrils and transform just beneath the surface of the ground.

THE HOUSE-FLY AND ITS RELATIVES

FAMILY *Muscidæ*

IN this group we have the common HOUSE-FLY, HORN-FLY, STABLE-FLY, the BLOW-FLY, and others. The larvæ of these Flies are true Maggots, and feed on decaying matter and filth, and their development is rapid.

The Blow-fly (*Calliphora vomitoria*) is a good familiar type. The eggs are laid in meat, and hatch in twenty-four hours or less. In about a week it is ready to pupate, and two weeks later the mature Fly appears. They are often a nuisance. I recall once camping in the far west. We had crossed a mountain and had made camp in the foothills near a desert, many miles from human habitation and seventy miles from the nearest post office, yet we could scarcely eat in peace, or lay out food without the Blow-flies getting at it.

ANTS, BEES, AND WASPS

ORDER *Hymenoptera*

INSECTS belonging to this group have four membranous wings. These have few cross-veins, and some species have none. The hind wings are much smaller than the front ones. Metamorphosis is complete. Mouth parts are formed for biting and sucking. In many species the females have a sting.

To me this is the most interesting of all the orders of insects. The communal life and marvelous instincts of many species of Ants, Bees, and Wasps excite our admiration, and in many respects the solitary species are just as interesting. Our best insect artisans belong to this group, and their work is marvelous, even though it is done by instinct.

This order is a large one. There are really thousands of minute species, especially of parasitic forms. We will have space to discuss only some of the larger and more interesting species.

As a whole, the Hymenoptera are very valuable in relation to man.

Boys like honey, but not many appreciate the great good that Bees do in fertilizing blossoms. Without them it would be practically impossible to have cucumbers, melons, and squashes; and apples, cherries, and other fruits would be about the same. The red clover depends upon the Bumble-bee to fertilize its blossoms, and most wild flowers are pollinated by various species of Bees.

Hymenoptera are often divided into two groups, the stinging and the boring. A good example of the boring variety is the PIGEON TREMEX (*Tremex columba*). It is sometimes called the PIGEON-HORNTAIL. It resembles a large Wasp, is about an inch and a half long, with reddish-brown thorax, and black abdomen banded with yellow. On the under side of the abdomen of the female is a boring machine of stiff, wiry material. When boring, this drill is held at right angles to the body, and it works in solid wood, often drilling half an inch deep. An egg is laid at the bottom of the burrow; and when it hatches, the larva feeds on the heart wood, making a tunnel a little larger than its body. It is a whitish grub, about an inch and a half long, and pupates within the burrow, forming a cocoon of silk and tiny chips or sawdust. The adult insect eats its way out through the wood and bark.

The larva of the Pigeon Tremex is parasitized by a very remarkable Ichneumon-fly, sometimes called "The Longtail" (*Thalessa lunator*). On the end of its body is a bristle-like tail, or ovipositor, which is nearly six inches long. This is her drilling machine. Sometimes she bores in stumps and in recently fallen logs. She arches this drilling machine over her back, and with the aid of the muscles in her hind legs and tail, makes a derrick out of her body. She can drill an inch deep, or even more, in solid wood. The drill though flexible is very hard and strong. This Long-tailed Ichneumon, when she finds a tree infested with the larvæ of the Pigeon-horntail, selects a spot that she thinks is opposite a Horntail burrow and begins to bore. When the drill reaches the burrow, she deposits an egg, which forms a grub that soon finds its way to the larva of the Horntail and feeds upon it and finally destroys it. The next year the Ichneumon matures and eats its way out of the tree or log. Some times these insects get their boring machines fast in the wood and are held prisoners until they die. The Pigeon Tremex is also apt to get the boring machine fast, and it is a common sight to find them held to a tree. The Tremex is apt to attack trees that are in a weakened condition, and a year or two later they nearly always die. Sometimes they use trees that have recently died. The males of both Horntails and Longtails are much smaller than the females, and of course have no drilling apparatus.

We almost forgot the SAW-FLIES. They form quite a large family.

The best known representative is the AMERICAN SAW-FLY (*Cimbex americana*). This is the largest species in this country. It is nearly an inch long, with stout body and heavy legs. The head and thorax are black, and the abdomen is purplish-blue. The abdomen of the female has a pair of saws that fit in a groove, and can be shoved out and worked up and down. With this instrument she cuts slits in leaves or twigs and deposits the eggs. The larva is pale greenish-white, and much resembles a caterpillar. I have found them on willow, but they also eat the leaves of elm, poplar, linden, and birch. The larva has more legs than a caterpillar, and has the habit of curling the body to one side.

GALL-WASPS

SUPER-FAMILY *Cynipoidea*

THESE are small dark-colored Hymenoptera that are rarely seen, but the result of their work is familiar to most all boys. It was once thought that the Wasp in depositing an egg in the leaf or twig, injected a drop of a poisonous solution into the wound which caused it to swell and form an abnormal growth. Now we know that the enlarging of the plant tissues does not take place until after the egg is hatched. The abnormal plant growth is probably caused by the agitation of the larva and substances secreted by it. The form and nature of the Gall depends upon both the genus of insects and the kind of plant or tree affected.

A Gall familiar to most boys is the FIBROUS OAK-APPLE (*Amphibolips coccineæ*). This occurs chiefly on the scarlet oak. In the center of the Gall is a hollow ball containing the larva, or at least the space where the insect was developed. Fibers radiate from the center to the outer shell. This Gall is from one to two inches in diameter. In southwestern Pennsylvania, where I lived as a boy, the scarlet oaks were very plentiful, and also these Galls. Some scarlet oak trees would have dozens of these oak Galls every year, while other trees of this species, standing near, would be almost free from them. Just why certain trees are subject to attack by Gall-wasps, we are unable to say.

The SPONGY OAK-APPLE (*Amphibolips spongifica*) is found chiefly on the red oak and black oak. In this species the space between the center and outer part is filled with a spongy mass, which suggests the name.

The larger EMPTY OAK-APPLE (*Holcaspis inanis*) has only a few fibers between the central kernel and the shell. It is a little more than an inch in diameter, and is found chiefly on red oak and scarlet oak.

A very common Gall on the oaks of eastern United States is the BULLET-GALL (*Holcaspis globulus*). Instead of being on the leaves, this one is found on the twigs, and sometimes there are hundreds of them. It is from one-half to two-thirds of an inch in diameter, and is apparently most common on the white oak. The central kernel is surrounded by a hard, almost woody substance. A common Oak Gall of the Pacific coast, is the GIANT OAK GALL (*Andricus californicus*). It is often more than three inches in diameter, and instead of producing a single insect in the center, it has several cells, all of them producing Gall-wasps. It is found chiefly on the California white oak, and the balls are conspicuous objects in winter.

EMPTY OAK-APPLE

PITHY BLACKBERRY-GALL

Another familiar Gall, and one that always interested me as a boy, is the PITHY BLACKBERRY-GALL (*Diastrophus nebulosus*). It is often two or three inches long and an inch or more thick. Many Gall-wasps are produced in one Gall. This one is developed on the canes of the blackberry, and the texture of the growth is hard and woody.

An observing boy will find a great many other Galls. Some are found on rose-bushes, others on the stems, leaves, or roots of a great variety of plants.

ANTS

FAMILY *Formicidæ*

THESE insects are known to everybody, and need no description. The family is a large one, and the species vary much in habits as well as in appearance. They live in communities, and afford the finest examples of communal life. They are unselfish creatures, everything being done for the colony and nothing for the individual. Comstock says, if the statesman studies the nearest ant-hill, "he will find no complaint against the existing condition of society, no rebels; but the fate of each one is determined by the accident of birth, and each takes up its work without a murmur. He will find that this perfect commune has developed courage, patriotism, loyalty, and never-failing industry; but he will find also that war, pillage, slavery, and an utter disregard for the rights of other communities and individuals are as prevalent as they are among our own nations, where selfish private ambition has held sway so long."

Only a few days ago, I was called to see some strange actions of insects. When I arrived at the place I found the ground for several feet square practically covered with winged Ants. It was their nuptial flight. The day was warm and pleasant, with a slight breeze, and hundreds were leaving every minute. The majority of them flew with the wind. Within an hour they had all disappeared. The people who called my attention to these insects remarked that they never knew that Ants had wings. The workers do not have any, but both males and females do. When they drop to earth after the nuptial flight the female turns around and bites off her wings and goes to work to found a new colony. At first she does all the work herself, unless a few workers from the mother colony happen to find her and attach themselves to her as servants. Ants are very careful of the queen, and guard her and care for her in true royal fashion. Unlike the queen bee, she is not jealous, and often many queens live in harmony in one ant-hill. The male Ants generally die young, but the females and workers may live a long time. Sir John Lubbock kept two queens for over seven years and some workers for more than six.

Nearly every boy who has been in the country has some time or other turned over a flat stone and has seen Ants scurrying beneath it. Ant-eggs may be seen, also the larvæ, and something else almost as large as an Ant itself. They are light brown or cream colored, and oblong in shape. These are the pupæ or cocoons. The Ants generally grab them first and carry them down to safety. The eggs, larvæ, and pupæ are well taken care of by the worker Ants. They are moved from chamber to chamber in order to get sufficient moisture and warmth for their best development. When the mature insects come from the cocoons, the nurse Ants help them out, unfold their legs, and take the very best of care of them.

There are usually two kinds of workers in an Ant colony. The one is much larger than the other, and they seem to do the work that they are best adapted to do.

Ants are great warriors and fight fiercely. While they fight chiefly with their jaws, they also throw formic acid on each other. If one gets a hold that seems to his advantage, he may retain it for hours. They generally wage war against other species, but sometimes if two colonies of the same kind are near, they may attack each other. It is said that before an army starts to fight, they send out scouts and wait until the scouts return before going forth. The object of fighting is often to capture slaves. Of course, the colony attacked fights fiercely, but if they are overcome, the attacking army carries off the larvæ and pupæ and bring them up in their own colony. These Ants, as they mature, act as servants or slaves, and work hard for their masters. One European species the SHINING SLAVE-MAKING ANT (*Polyergus rufescens*) is so dependent upon slaves that they cannot take care of their young or even feed themselves without the aid of servants. They have only retained the powerful jaws and fighting powers to capture more slaves. A variety of this species is found in this country, and cannot exist without workers of another species.

The large CARPENTER ANT (*Componotus pennsylvanicus*) is a common species. It is one of our largest Ants, and is entirely black. If you take a walk in the woods some bright sunny day and search carefully you will be quite sure to discover a colony of these insects. You may find them in a fallen tree, or probably in a stump. They prefer wood that is not much decayed, yet just enough to make it brittle. With their powerful jaws they can bore and chisel or carve in fantastic shapes. In case the colony is in the stump, you will probably see bits of sawdust scattered on top of it, and much sawdust that has been tossed over the edge of the stump to the ground. You will also find a hole or two leading into the interior. If you can, pry out a piece of wood from the top of the stump. If the light is good you can see down into the cavities for several inches. The spaces are divided into dozens of rooms and passageways. It seems really marvelous how Ants can work so skillfully. Between the cavities the wood is often but little thicker than coarse paper, yet the tunnels do not run into each other, except where there are cross-roads. Moreover, Carpenter Ants do all their work in the dark. In some of the rooms you can see larvæ, and in others are the pupa cases. In a short time the latter will be fully developed, ready to take up the carpenter trade. With some object gently hit the stump. See how the Ants come up and fill the rooms and pathways. They grab the young Ants and quickly take them down out of danger. "Safety first" is their motto. Replace the piece of wood you took from the top of the stump.

Here come several Ants with some food. It is a small snail in a shell. Although it is much larger than an Ant, yet one of them can easily move it. How will they get it through the narrow entrance into their home? Some of the Ants get above it, and others below. They roll it over, they turn it round and round. At last it fits the opening and is taken down the dark and narrow hallway to their home. One would think that King Solomon had these little carpenters in mind when he said:

> "Go to the Ant, thou sluggard.
> Consider her ways, and be wise.
> Which having no chief,
> Overseer, or ruler,
> Provideth her bread in the summer,
> And gathereth her food in the harvest."

Several species build mounds. Perhaps the best known is called the MOUND-BUILDING ANT (*Formica exsectoides*). It is found through the uplands of the East, and especially in the Appalachian Mountains. Some of these mounds are a foot high and five or six feet in diameter. Several other species build mounds, but generally not such large ones. The head and thorax of this species are brownish-red and the legs and abdomen are nearly black.

A common slave-making ant is *Formica difficilis*. It closely resembles the last species, and sometimes builds low mounds. Its nest is often found beneath large flat stones. It is not entirely dependent upon slaves, but they are often found in the nests.

The SLAVE ANT (*Formica subsericea*) is dark brown or grayish-brown with reddish legs. It builds mounds in sunny, grassy places, or sometimes under stones, and is one of the species that attends on Plant-lice. Its nest is often raided by the last named species, and the larvæ and pupæ are carried off to become slaves.

The RED-ANT (*Monomorium pharaonis*) is the most troublesome species about houses. It is very small, of a pale yellowish-brown color, and is very fond of cakes and sweet things generally. It is a native of Europe and has spread nearly all over the world.

In the dry regions of the West and Southwest, Ants are very numerous. A very interesting species, found at high elevations in the Southwest, is the HONEY-ANT. These build low mounds only a few inches across. Some of the members of the colony are honey-bearers. They cling to the roofs of the chambers, their abdomens extended to the size of currants, and are filled with honey or a form of grape sugar. The worker Ants gather this nectar from a gall that grows on a dwarf oak. The Honey-ants in the nest are receptacles for holding the nectar. In times when food is scarce this honey is given out to those Ants that need it.

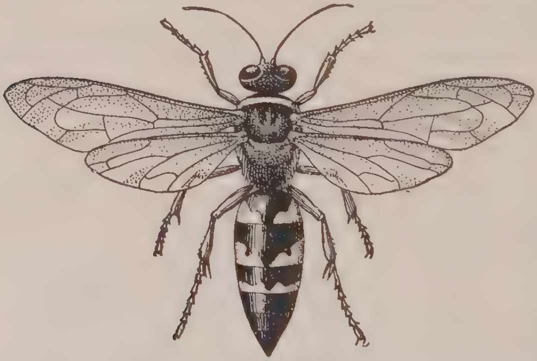
Several species of HARVESTER ANTS occur in Western United States. They gather the seeds of various kinds of grasses and store them up in the nest for food. It was once thought that they planted the seeds of grasses so that they would get a crop, but this is now believed to be untrue.

Ants are probably our most numerous insects. If we were to go out on a field or even uncultivated soil and try to enumerate the insects found on a plot of ground two feet square, both above and below the surface, Ants would probably make up the largest group.

I remember once walking out in the fields with our good old friend John Burroughs. We came to a place where the grass was tall, and he got down on his hands and knees with his face near the ground and looked long and steadily. I asked him what he was doing, and he remarked that he was looking at the insect forest, especially as the Ants see it. Try this for yourself.

WASPS

WASPS are generally divided into two groups for convenience in studying them, *i. e.*, social and solitary. The latter form several insect families, and many of them have the habit of digging burrows in sandy banks, or sometimes in more solid earth. A good representative is the CICADA KILLER (*Sphecius speciosus*). This large Wasp is about an inch and a quarter long, brownish-black, with the abdomen banded with yellow. It digs a burrow in the sandy soil, sometimes nearly two feet deep, but generally not so deep, with some lateral channels. It provisions the nest with Cicadas. When the Wasp hears a Cicada sing, it locates it, paralyzes it with its powerful sting, and then carries it to its burrow. The Cicada is food for the larva of the Wasp. When I was a boy, we frequently watched these Wasps as they brought Cicadas to their burrows on a large island in the creek. They selected sunny, sandy places, and often there were more than a



CICADA KILLER

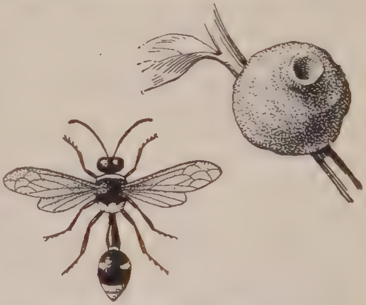
dozen burrows in one small locality. There were trees on one side of this island, and they seemed to have no trouble in getting Cicadas. If a Wasp got too tired carrying a Cicada, it would drag it the remaining distance.

The largest Wasp in this country is the GIANT TARANTULA-KILLER, or TARANTULA-HAWK (*Pepsis formosa*), of California and the Southwest. It has a bluish-black body and orange-yellow wings. This Wasp stores its burrows with the great hairy spiders known as Tarantulas. The Wasp does not always come off victorious, for sometimes he is caught and killed by the spider. Interesting but fierce combats between the two are sometimes observed.

Many species of Wasps dig burrows in sand banks. Some of these are stocked with spiders, others with caterpillars or grasshoppers. One day I watched one while it brought to its burrow three Wasps, each larger than itself. When it came out of the tunnel it covered the entrance with sand and smoothed it off, then flew away. I followed it with my eyes until lost to view, then turned to look at the entrance of the burrow, but was not sure of the spot by several inches. When the Wasp returned, it alighted in the sand, walked a few inches to one side, took its head and feet and uncovered the entrance to the tunnel and crawled in with its burden.

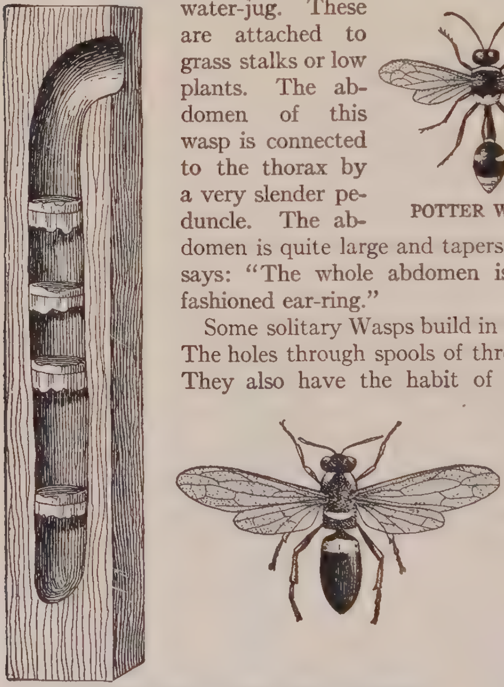
The most familiar of these Wasps are the MUD-DAUBERS (*Sceliphron cementarium*) that build nests under projecting rocks, or beneath roofs, especially of sheds. I am writing these lines in a camp in the Catskill Mountains. Over my head the Mud-wasps are building their nests against the roof. There are nine nests in all in process of construction. One is situated almost directly above me. As I write, occasionally a ball of mud nearly as large as a small pea falls on my clothing or paper. The nest is built of a number of cells, each provisioned with spiders. On the last spider an egg is laid, which soon hatches into a little white grub that feeds on the spiders and grows rapidly. When fully grown it spins a silken cocoon about itself and there remains until the next spring, when it changes to a pupa and then to a mature insect. Last summer I had a good opportunity of observing one of these Wasps. For more than a month, it was busy gathering mud, building cells, and collecting spiders. In all it built twenty cells each about an inch long. The nest was accidentally knocked down and I carefully took it apart. In two or three of the cells the young Wasps had formed cocoons, in others were active grubs or merely eggs. The spiders were mostly living but paralyzed. The cells which were scarcely more than an inch long were crowded with spiders, the number depending on their size, ranging from eight to twenty in each cell. Counting as accurately as I could, I estimated that there were two hundred and sixty spiders in the twenty cells. These spiders are chiefly of a pale-yellow species found about the cracks in buildings, and the Wasps are often seen searching for them. Following the Wasp, I found it got the mud at a little stream about one hundred feet away. It was often not longer than a minute and a quarter from the time it left the nest until it returned with the mud. When all the cells are finished and stocked with spiders and an egg deposited in each cell, then the Wasp covers the outside with mud, so that it has somewhat the appearance of a lump of mud having been thrown against the roof.

The Potter Wasp (*Eumenes fraternus*) is a very interesting species. It forms vase-like mud cells that resemble a miniature water-jug. These are attached to grass stalks or low plants. The abdomen of this wasp is connected to the thorax by a very slender peduncle. The abdomen is quite large and tapers to a point. Comstock says: "The whole abdomen is shaped like an old-fashioned ear-ring."



POTTER WASP AND MUD CELL

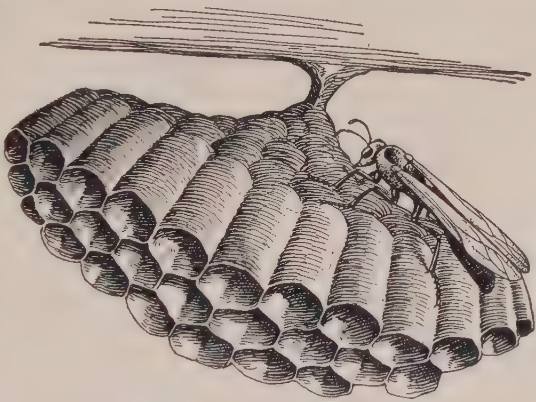
Some solitary Wasps build in small holes of all kinds. The holes through spools of thread are favorite places. They also have the habit of stopping up keyholes. The Carpenter-wasp (*Monobia quadridens*) is interesting because it tunnels chambers in solid wood. These tubes are often three or four inches long. They are divided into cells by mud partitions. Although this Wasp is common through the Eastern States, yet we do not know a great deal about its habits. An observing boy who is lucky enough to find a Carpenter-wasp building her nest could add to our knowledge of the habits of this insect



CARPENTER-WASP AND NEST TUNNEL

The social Wasps, like the Ants, build nests for a home as well as to perpetuate the species. They exhibit among the very highest forms of insect architecture. Like the Ants, there are three forms of these insects, males, females, and workers. During the early part of the summer, only worker-wasps are produced. Later in the year, some males and females appear. In autumn, the males and workers die off and the females crawl away into some protected place and spend the winter. The next spring they come forth, and each female starts a colony by beginning a nest, constructing cells, depositing an egg in each cell, and feeding and taking care of the young until the first mature wasps appear. They then take charge of the work. After that the female or queen only lays eggs in the cells that the workers build.

The male Wasps do not sting, but the females and workers have that ability. In other respects the males closely resemble the females and workers. The young of Wasps are fed on other insects. They are fond of flies. Wasps sip fruit juices, nectar from flowers, and also honey-dew which they collect from aphids, or rather from leaves infected by aphids.


POLISTES PALLIPES WITH COMB

To the genus *Polistes* belong the black or rust-colored Wasps that build single, uncovered paper combs in protected places. Probably the most common species in the Eastern States is *Polistes pallipes*. They often build under the roofs of sheds, barns, or other open buildings, or under stones. They are occasionally attached to branches of trees. Sometimes these combs are five or six inches across. The young are fed on caterpillars, and probably juices of fruits. They are an enemy of the cabbage-worm or larva of the cabbage butterfly. Just recently I had quite an interesting experience with these insects. In camp a nest four or five inches in diameter was situated almost above the shower bath. They became troublesome and the nest had to be destroyed. We placed a table beneath the nest so that we could reach it, but it was so situated in an angle of the roof and near a rafter that we could not smash it. At last we decided to take a large bunch of cotton and push it against the nest. This was done effectually, so far as destroying the nest and most of the Wasps was concerned. However, five of the Wasps escaped by some means. The next day they collected about a foot from the original nest and began to build another. In ten days, they had another nest constructed that was nearly three inches across, but the cells were only about half the usual depth. They then stopped building, and for the last two weeks have simply crawled about over the nest, as though expecting something to happen. When the first nest was destroyed, the female or queen was killed, and of course there are no eggs in the cells of the second nest. For the last two weeks these Wasps have done no work, but they stay on the nest, and in our imagination seem to have a puzzled look.

Most boys are familiar with the small Wasps known as YELLOW-JACKETS. There are several species, but perhaps the most common one is *Vespa germanica*. They generally build in the ground, or under the roofs of buildings or other protected places. When I was a boy we once cut down a large hollow tree, supposing that there was a hive of Bees near the top. Insects that appeared to be Bees entered the tree about sixty feet from the ground. After the tree had fallen, we found a large Yellow-jacket's nest, but no Bees.

There are often thousands of Yellow-jackets in one nest. Mr. Marlatt found one that he carefully estimated to contain about fourteen thousand cells, and many of these cells are used two or three times in a season. These nests, like those of Hornets, have a paper covering on the outside. There are several horizontal combs, one above the other. Last year I helped to take down a small Yellow-jacket's nest that was built on the ceiling of a front porch. We took a cyanide bottle and placed it over the entrance to the nest, and the Wasps all came out into the bottle. A minute later they were dead. We then removed the nest. As the work was done at night, no insects escaped. This was quite early in the season The nest contained a queen and twenty-one workers. The queen was nearly double the size of the workers. There were twenty-six young that had the cells capped over; in other words, they were in the pupa state and would have matured in a few days. There were a hundred and forty-nine cells that had eggs or larvæ.

The WHITE-FACED HORNET (*Vespa maculata*) is perhaps the best known of all our Wasps. Those who have felt its powerful sting will rarely forget it. It builds the large paper nests, sometimes a foot long, with a hole at or near the bottom. These nests are attached to branches of trees, or on blackberry bushes, or sometimes under the projecting roofs of buildings. The nests are made of good paper, and Wasps were the first paper-makers. The paper is produced from wood pulp, and the Wasp collects it from boards or trees that have had the bark removed by accident or other means. In collecting the pulp, the Wasp goes backward, scraping off the pulp with its jaws and moistening it as it goes, forming a round ball of paper pulp which is spread into a sheet in the nest. When they enlarge the inside, they either use the material for making comb or add it to the outside.

I once found a Hornet's nest built on the outside of a window frame. It was about four inches across, and the glass served as one side of the nest. There were about two dozen Hornets in the nest, and work was going on rapidly. I could stand on the inside of the building and watch them feed the young and construct the nest. They feed the larvæ animal food, chiefly flies, reduced to a pulpy form. A few days later, I came again to watch the Hornets, and you can imagine my disappointment to find the nest destroyed. I will probably never again be able to see Hornets work on the inside of their nest.

Hornets are of real value in destroying flies and other insects, and yet if their nest is found by boys, it is pretty sure to be demolished.

The large ENGLISH HORNET (*Vespa crabro*) has been introduced in the region about New York, and is slowly spreading. It is now found over nearly the entire state of New Jersey. The Wasp is colored much like a Yellow-jacket, but is large, being an inch or more long. The nest is built generally in a hollow tree. I found one about twenty feet from the ground. After they filled the space in the tree, which was apparently not large, they built out through the opening and constructed an external nest about a foot long and six inches in diameter. This nest was nearly cylindrical, and the paper, which is not strong, is of a dirty yellowish-brown color. Every season these Wasps come to my lilac bushes and peel the outer bark from some of the branches. They apparently use it in the construction of their nests.

BEES

LIKE Wasps, Bees are of many species, and they are both social and solitary. The young are fed on a mixture of pollen and nectar and the mature insect feeds on a similar diet. In collecting this material a great many blossoms are pollinated.

Bees belonging to the genus *Andrena*, are solitary, with mining habits. They are average size, or a little smaller, and dark in color. These Bees dig holes in the ground, forming perpendicular shafts sometimes a foot deep. Along the main shaft are short side-branches or cells partly filled with pollen mixed with nectar. On each food mass an egg is laid. These Bees generally make their burrows in pasture fields, and often there are hundreds of tunnels in a few square feet. They have learned to live in town, but each one works independent of his neighbors. The Bees belonging to this genus are widely distributed, and nearly fifty species are recorded from New Jersey, alone.

A much larger MINING-BEE, and one that belongs to a different family, has the long name of *Emphor bombiformis*. The northern variety is *fuscojubatus*. It much resembles a Bumble-bee in appearance. It digs a perpendicular shaft about five inches deep, without side branches. It places, generally, three balls of pollen in this tunnel, each more than half an inch in diameter. As they enter the shafts, the whole rear of the body sometimes appears to be covered with pollen. One ball of pollen is placed at the bottom of the hole, another about an inch higher, and a third an inch above the second. They excavate a cavity for each ball. On each mass of food an egg is placed. The young grow rapidly, but the complete development does not take place until the next summer. These Bees live in town, generally where the ground is bare and somewhat sandy. I have found a thousand tunnels in a space much less than ten feet square. Those that I have observed collect the pollen chiefly from the marsh-mallows (*Hibiscus*). In the company of George A. King, the artist who has made the illustrations of insects for this volume, I have dug out many tunnels or nests of these Bees, and have found them all practically alike.

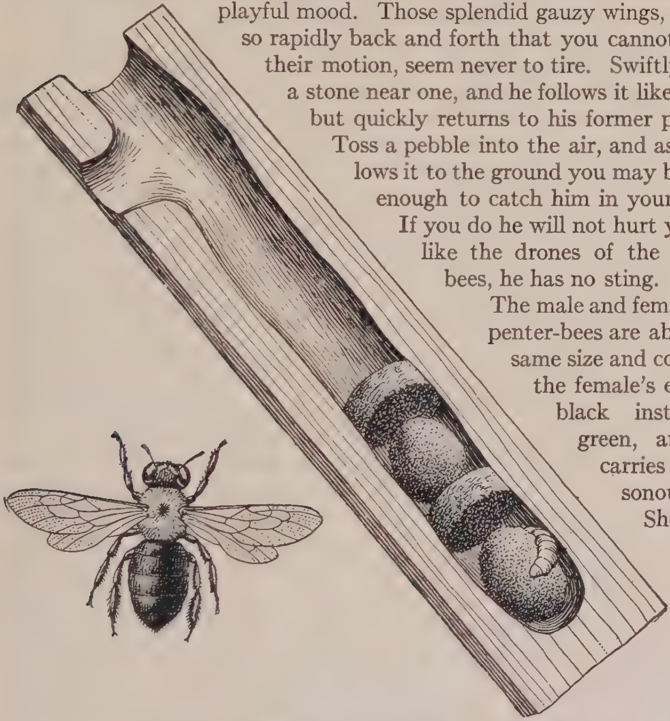
There is another group of solitary Bees known as the LEAF-CUTTERS, belonging to the genus *Megachile*. They often burrow in the stems of plants, or use natural cavities in wood. They have the habit of cutting circular pieces from leaves and lining the cells with them. These pieces are skillfully fitted and glued together.

LEAF-CUTTING BEE

I was once seated on the veranda of a friend when we happened to notice a Bee drop a circular bit of leaf on the floor. A few minutes later it came with another and entered a small opening near the door. About every five minutes it came with a piece of leaf. Following it across the lawn we found where it had cut pieces out of rose-leaves. Dozens of patches had been taken from rose-bushes. Using its mandibles for scissors, it cut these pieces from the leaves and cleverly held them during the process so that they would not fall.

The Carpenter-bee (*Hylocopa virginica*) is one of the most interesting insects of my acquaintance. It is as large as a Bumble-bee and looks much like one, only its heavy, thick body is slightly more flattened, and its color is nearly black.

The male Bee is a beautiful insect. The most striking thing about him is his large eyes, which are of a beautiful green. During the sunny days of May and early June these Bees may be seen for hours at a time poised in air before their nests, or darting hither and thither at one another in playful mood. Those splendid gauzy wings, moving so rapidly back and forth that you cannot detect their motion, seem never to tire. Swiftly throw a stone near one, and he follows it like a flash, but quickly returns to his former position. Toss a pebble into the air, and as he follows it to the ground you may be quick enough to catch him in your hands. If you do he will not hurt you, for, like the drones of the Honey-bees, he has no sting.



CARPENTER-BEE, AND GALLERY IN SOLID WOOD

The male and female Carpenter-bees are about the same size and color, but the female's eyes are black instead of green, and she carries a poisonous sting. She is not hot-tempered, however, and probably would not use the sting unless captured. Unlike the Bumble-bee, she does not have pollen baskets on her hind legs, but instead her hind legs are covered with a stiff brush of short hairs for sweeping chips and sawdust out of her house.

The female is the real carpenter. I have watched her construct her home from the very start. She generally selects a soft pine board or post well protected from the storms. Under the eaves or projecting roofs of houses and porches are favorite places. I have never seen them bore in oak or other hard wood. Before houses were made, they tunneled into the dead branches of pine and linden trees, and occasionally one may still see holes bored in a tree in their native haunts. After selecting a site for her home, the mother begins to bite out pieces of wood with her strong cutting jaws, operated with powerful muscles. With these tools she bores her tunnels. As she works, she moves round and round, attacking the job from all sides to produce symmetry. Little chips of sawdust may be seen to fall to the ground or go floating off through the air. The work progresses slowly at first, for she has to bore against the grain of the wood. She makes her hallway about three-fourths of an inch deep, or nearly the length of her own body. It is almost half an inch in diameter, round, smooth, and more neatly done than a hole made with a carpenter's auger.

She now starts to work on her real home by boring a tunnel at a right angle to her entrance hall. The work now apparently becomes easier for she follows the grain of the wood. The tunnel is made half an inch in diameter, and ranges from ten to eighteen inches long. She belongs to no labor union and does not work on an eight-hour system. During the warm July nights one can often hear her at work biting off bits of wood accompanied by a sort of humming grunt. If the wood is not too hard she bores about half an inch a day. Hers is no easy task. The mass of sawdust and chips, as it accumulates, is passed backward by her front legs, which she uses as hands. It is then swept out by the stiff brushes of hairs on her hind legs. I have examined many of these tunnels, some of them eighteen inches long, constructed in inch pine boards, yet in not one of them has the tube come to the surface. She is a true carpenter.

When the tunnel is finished, the mother makes a separate room for each little Bee by putting in partitions made of little chips and sawdust glued together with some sticky substance. The chambers or cells are nearly three-quarters of an inch long. The mother puts into each cell a loaf of bee-bread. Bee-bread is made of pollen held together and sweetened with honey. During the warm summer days, the mother may be seen gathering pollen from the hollyhocks and other flowers, or entering her home with her legs covered with pollen dust. The carpenter now becomes a harvester. What work it must take to gather material for a dozen loaves of bread the size of large kidney beans! On each pollen mass an egg is placed, which soon develops into a little white grub. The larva has nothing to do but eat and grow, and at maturity is nearly an inch long. In this condition it lives all winter, but when the warm days of spring arrive it quickly develops into a full-fledged Carpenter, ready to spread its gauzy wings in the sunshine or bore a tunnel of its own.

When I was a boy, we had a large back porch made of soft pine wood, and although it was painted yet the projections of the roof were literally honeycombed with the nests of these bees. My father offered to pay me a certain price per dozen for killing them, and for several years I killed dozens of them, yet as the years went by they seemed as plentiful as ever. They clean out the old tunnels and use them year after year, yet every summer new holes were bored.

There is a still larger Carpenter-bee in California, that bores in the dead branches and trunks of pine trees. The small Carpenter-bee (*Ceratina dupla*) has a wide range. Its nest is made in the pith of briers and the dead stems of sumac. The cells are partitioned off with mud and stored with a pasty mixture of honey and pollen. In speaking of this Bee, Comstock says: "She rests in the space above the last cell, and waits for her children to grow up. The lower one hatches first; and after it has attained its growth, it tears down the partition above it, and then waits patiently for the one above to do the same. Finally, after the last one in the top cell has matured, the mother leads forth her full-fledged family in a flight into the sunshine. This is the only case known to the writer where a solitary Bee watches her nest till her young mature."

GUEST-BEES, or INQUILINES, belong chiefly to the genus *Psithyrus* (formerly *Apathus*). These insects resemble Bumble-bees, but they have no baskets on their hind legs for carrying pollen. The males are difficult to tell from the male Bumble-bees. They enter Bumble-bee nests and make themselves at home. They eat the honey and deposit eggs in the nests of the hosts. They do not work in the nest, and in a sense are parasites. The Bumble-bees feed and care for their young, and when full grown come and go as they please. Other CUCKOO-BEES inhabit the nests of some of the solitary species.

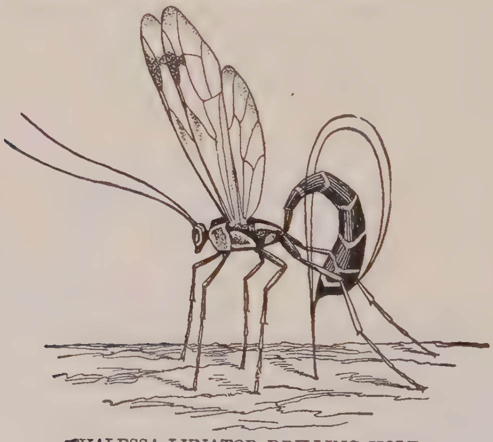
THE BUMBLE-BEES

(*Bombus*)

EVERY boy is acquainted with the Bumble-bees, and they scarcely need any description here. They are found over this entire country, and some of the numerous species have a rather wide distribution. Like the Honey-bee, there are males, females, and workers. The workers are imperfect females. During the early part of the season only workers are produced. In the latter part of the summer, males and perfect females appear. The females or queens are the only ones to survive the winter. In autumn, they crawl away in some protected place and hibernate until spring. When the flowers appear in May, these big Bumble-bees come forth and search for a place to build their nests. They usually select a deserted mouse nest, sometimes above ground, and other times below the surface. A cell is made, stored with pollen and honey, and an egg is placed on it; similar cells are placed by the first. The larva develops quickly, and when full grown spins a silken cocoon about itself. The queen is said to brood over the pupa, especially in disagreeable weather. In two or three weeks the worker Bees come from the cells and immediately take charge of the labors of the nest. The old pupa cases are cut off at the one end and become pots for storing honey.

When I was a boy, I often helped to destroy Bumble-bee nests chiefly from the excitement caused by the danger of being stung. Sometimes we paid dearly for the mischief. We should not forget that "even insects have their rights." Bumble-bees are the chief agents in fertilizing the blossoms of red clover, and many cultivated flowers are pollinated by this insect.

The Honey-bee (*Apis mellifica*) needs no description here. It probably has been more studied, written about, and talked of, than any other insect. It is a native of Europe and Asia, but has been domesticated the world over. Not very thoroughly domesticated, however, for "the call of the wild" is strong in them, and many a fine swarm goes off to the woods. This insect is worthy of careful study, and if we do not have the opportunity of observing a hive, we can at least watch them as they go from flower to flower, collecting nectar and pollen.



THALESSA LUNATOR DRILLING HOLE

SPIDERS

BY CYRUS R. CROSBY

SPIDER WEBS IN THE EARLY MORNING COVERED WITH DEW

FROM A PHOTOGRAPH BY HUGH SPENCER

FOREWORD

TO ONE who wishes to study the life of Spiders, material is always at hand. There is scarcely a place where these ingenious hunters and trappers of insects do not abound, and except in the depth of our Northern winters they may be studied in the field at almost any time. They are among the earliest creatures to stir from their winter quarters in the spring, and some of them are afield until late autumn. Under certain weather conditions certain species may be found crawling on the snow on warm winter days even in the Northern States.

Spiders live in a great variety of situations. A few kinds are found in our houses and about buildings. Some inhabit cellars, or tunnels, or they are found under bridges and culverts. A few species maintain their existence in the perpetual darkness of caves. These are of great interest, since most of them are blind, and the others have the eyes reduced to minute functionless dots. Spiders live in the greatest abundance, however, in thickets, woodlots, and in the edge of heavy forests. Upland pastures which are never plowed and lowland meadows are favorite haunts of numerous species. Dark, shady ravines, moist and cool, have their own spider population. The sand dunes along the seacoast, the pebbly shores of lakes and streams, and the muddy margins of marshes, each have species peculiar to them. Peat-bogs are of great interest to the collector and student of Spiders. Here one can study many strange and rare forms not found elsewhere except in the far North. On the tops of high mountains one also finds representatives of the Spider fauna of the Arctic regions. Whenever one goes to the South in winter, or to the seashore or mountains in summer, one is sure to find an abundance of Spider friends to keep him company.

For studying Spiders, one needs only a modest equipment. For examining webs, a common reading glass with handle is very convenient and useful. For collecting Spiders to be kept alive, large-mouthed vials, or shell-vials, may be used. If these are not at hand, pill-boxes, or even paper bags, may be utilized. If one wishes to preserve Spiders for a collection, it is necessary to keep them in alcohol. For this purpose pure 95 per cent. grain alcohol is the best, but as this is difficult to obtain, denatured alcohol may be substituted. A small pair of forceps for handling small specimens is almost a necessity, since Spiders are soft-bodied and easily crushed if picked up in the fingers. An insect net is useful for sweeping specimens from bushes, grass, or weeds. For collecting the small Spiders that live in leaf-mold or moss, or in the trash along the seashore, a sieve is indispensable. Such material is sifted over a white cloth. Many of the Spiders feign death at first, but if left undisturbed soon attempt to run away. The smaller ones can be picked up without injury by touching them with the forceps wet with alcohol.

In looking for Spiders, one adopts a number of methods. Turning stones and logs will disclose the hiding places of many forms. Pulling the loose bark from dead trees and logs gives many more. Those that spin conspicuous snares are best located by searching for their webs. Many Spiders that live on the branches of trees are most easily captured by shaking the branches over a sheet, or by beating them over an insect net or inverted umbrella.

THE STRUCTURE OF SPIDERS

SPIDERS are not classed with insects, although they resemble them in many ways, and are, in fact, rather close relatives. They differ from insects in having four instead of three pairs of legs and in having the body divided into two instead of three divisions. In Spiders the part corresponding to the head and thorax of insects is united into a single piece called the *cephalothorax*, or head-thorax. Spiders never have wings, a character that serves to separate them from most adult insects.

Most Spiders have eight eyes arranged in two or three rows across the front part of the head. There are a few Spiders with only six eyes, and some of the species living in caves are blind. This is often the case with animals living in total darkness; having no use for eyes, these organs have been lost.

Spiders feed almost entirely on freshly killed insects. Their mouth-parts are especially fitted for this kind of food. These consist of a pair of jaws in front of, and over the mouth. Each jaw consists of two parts, a stout basal piece and a slender, curved, sharp-pointed fang, which is attached by a movable joint so that it can be turned back into a furrow on the inner side of the basal part, like the blade of a pocket-knife. In all spiders except the Tarantulas and their relatives, the jaws move crosswise instead of up and down; when spread apart and with the fangs extended they present a most formidable appearance and are, in fact, excellent instruments for seizing and holding their prey. The Spider does not, however, depend on its strength to hold its struggling victim; it has an easier and safer way of quieting its prey. The fang has near its tip a minute opening which connects through a fine tube with a poison-gland. When the fang enters the insect a minute drop of the poison is forced out through the opening and its deadly work is soon apparent. If the insect is bitten in the neck where the poison reaches the brain, death is almost instantaneous; if the wound is made in other parts of the insect's body, the effects are slower but none the less sure. Just below the mouth there is a pair of jaw-like organs known as *endites*. They are used to crush the food and thus aid in extracting the juices.

Attached to the cephalothorax are eight legs and a pair of palpi. The legs consist of seven segments, and at the end are provided with two or three sharp claws. The palpi are borne in front of the legs; in the female they are leg-like in form and sometimes end in a claw as do the legs; in the male the terminal segment is enlarged and bears a complicated organ. The palpi serve the purpose of feelers and correspond to the antennæ of insects.

At the tip of the abdomen are to be found the spinnerets, from which is spun the silk for the webs, nests, and cocoons. The spinnerets are finger-like in shape and usually six in number. They are arranged in three pairs. The middle pair is usually the shortest, and always consists of one segment. The fore and hind pairs are larger, and the latter may have as many as four segments .

The silk is produced in glands inside the Spider's body. Seven different kinds of silk glands have been described, each producing a different kind of silk. No one Spider, however, possesses all seven kinds, five being the greatest number so far found. The glands are connected with the spinnerets by minute tubes or ducts. On each spinneret there is at the tip a soft area on which these ducts open known as the spinning field. The ducts terminate in minute erect tubes—the spinning tubes. The silk, which while within the spider's body is in a liquid state, hardens immediately on coming into contact with the air. The "liquid silk" from these dozen or hundreds of spinning tubes usually unites to form single or double thread.

Spinning Work

Spiders use their silk for many purposes: for their egg-sacs, for snares to catch insects, for retreats or shelters for themselves and their young, for binding their victims, and for the construction of aerial floats with which to sail away through the air to new lands and pastures fresh. Nearly all Spiders leave a thread of silk wherever they go; this is known as the drag-line. This line is attached anew from time to time as the Spider moves about. The thread is fastened very quickly by a few rapid movements back and forth of the finger-like spinnerets, which are held apart so that the separate threads do not unite; after which the drag-line is spun out. This attachment-disk, as it is called, appears to the naked eye as a small white dot. If one will place a fair-sized Spider in a thin glass vial or tube the whole process of making the attachment disk can be observed under a low-power hand lens. The drag-line is a most useful device. It saves the Spider many a fall and enables it to regain its position on leaf or branch whence it has been swept by the wind or frightened by an enemy. Many spiders escape danger by falling at the first warning and then catching themselves in mid-air by the drag-line. There they swing free in the air suspended by an almost invisible thread till the danger is past and it is safe to return to their former position. Spiders have always won the admiration of observing mortals by their ingenuity and perfection of the snares which they weave for the capture of their food. Many of the snares are marvels of engineering skill, and even those of simpler type are excellently adapted for the purpose of supplying their owners with fresh food.

We are all familiar with the orb-web of radiating lines or spokes supporting cross lines of sticky silk arranged in a spiral curve. Few of us, however, have taken the time or have the patience to watch the Spider build its web and thus learn some of the secrets of its construction. One cannot expect to learn them all from the first web, for no matter how closely we watch, some things are sure to escape us. Most ORB-WEB SPIDERS rebuild or mend their shattered snares late in the afternoon or early in the evening. They thus have a fresh web for use during the night when insects are most abundant on the wing.

One of the best places to observe the building of a web is the railing of a bridge. Here one is almost sure to find numerous orb-weavers. Let us visit our bridge just before sunset. Here and there will be seen torn and shattered webs of the night before. No spiders are in sight, for they are still hidden in their silken retreats in the crevices of the railing. Soon we see a GRAY CROSS SPIDER, a half-grown specimen, emerge from his hiding place and begin the construction of a new web to take the place of the one destroyed by the storm of the afternoon. The openings in the railing are nearly square and make the placing of the outer foundation lines a simple matter. First, a thread is stretched across one of the corners, then across another, and then these two are united by a third, cutting off one side of the opening. The operation is repeated on the other side, and the space thus reduced to the size of the orb which the spider wishes to make. The next operation is to place the spokes of the wheel, the radii as they are called. To do this the Spider first stretches a line across the open space between the foundation lines and then returns to the center of this line. Here she attaches another thread and returns to the circumference of the future orb, spinning out the thread as she goes and holding it free with one or both of her hind legs. This operation is repeated till all the spokes are in place. These radii are not placed in order, but the Spider places one or two on one side and moves to the opposite side in order to keep the structure symmetrical and in shape. The Spider under observation usually has twenty-one radii to her web, but the number varies slightly.

While putting in the radii the Spider has, at each return to the center, been making a hub for the wheel. In the present case it is a small area of finely meshed lines through which the radii can be traced. As soon as the last radius is in place the Spider finishes the hub. At this stage the web is a frail affair, as the radii hang free without any cross supports.

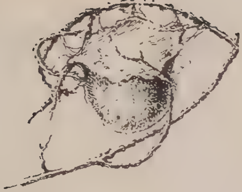
The Spider next begins at the hub and spins a thread in a spiral, making four or five turns. This thread is attached to each radius in a peculiar way. Instead of crossing it at right angles it is attached to it for a short distance and drawn tight so as to give a notched effect. This area of the web is known as the notched zone.

The Spider then goes round and round the web in an ever-widening spiral, putting in a temporary guy line. This is to hold the radii in position and give strength to the web till the permanent sticky threads can be placed in position. Up to this point the Spider has been using a dry silk that stretches very little. She now usually rests for a few moments before completing her task. Then she begins again, this time at the outside of the circle, and puts in the permanent spiral line. This is composed of a different kind of silk, which is elastic and coated with a sticky liquid which hangs on the threads as minute drops. This thread is admirably suited for trapping and holding insects which strike against it. The turns of the sticky threads are closer together than those of the temporary spiral and are evenly spaced, the distance being carefully measured off by the Spider, using her hind leg for the purpose. As she proceeds with her work she encounters, from time to time, the temporary spiral guy line which she breaks out, leaving the main part of the web, consisting of the sticky elastic threads, only supported by the dry inelastic radii. When she nears the center of the web she stops her work some distance from the notched zone, leaving a free space in which there are no cross lines. This is known as the free zone, and is used by the Spider as a means of passing from one side of the web to the other.

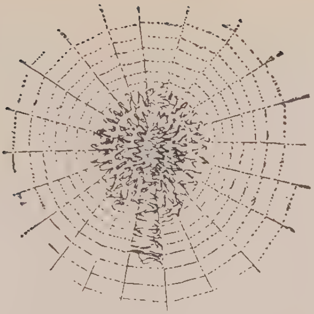
The web is now complete and the Spider takes her position, head downward, for some unlucky insect to fall into the snare which is ingenuously built for its destruction.

We have described in detail the method of spinning the web followed by the Gray Cross Spider, because there are a great number of Spiders that construct similar webs. None of these have exactly the same kinds of webs; they all exhibit certain modifications, but the general type is the same.

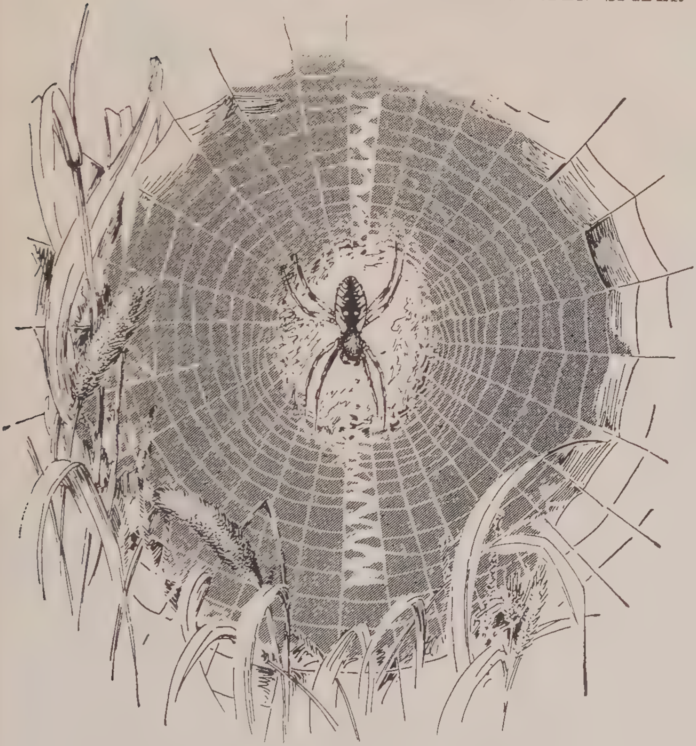
The ORANGE GARDEN SPIDER and the BANDED GARDEN SPIDER, two large orb-weavers commonly found in fields of rank grass and weeds and among low bushes, construct large strong webs in which the hub, instead of being an open meshwork, is sheeted over with silk, and the central part of the web is ornamented with a conspicuous zig-zag ribbon of silk.



EGG SAC OF A BANDED GARDEN SPIDER



CENTRAL PART OF WEB OF ORANGE GARDEN SPIDER



ORANGE GARDEN SPIDER AND WEB

From Drawings by Ellen Edmonson

Certain Spiders do not close the hub, but instead leave a circular opening. The spiny-bellied Spiders, common in the South, have webs of this kind, and when at rest stand in the opening with their legs reaching out to the surrounding web. The long-legged TETRAGNATHID SPIDERS, so common on the edges of lakes and ponds and along streams, spin nearly horizontal webs with an open hub. The beautiful LEUCAUGE also has a web with an open hub. This spider is bright green and silver-white in color, marked with yellow and red, and is to be found in its horizontal or inclined web in brushes or low trees in sunny situations.

WOLF SPIDER

Many orb-weavers do not remain in their webs while waiting for their prey, but rest in silken retreats, often in a folded leaf. They learn of the capture of an insect in the web by means of a telegraph line, or trap-line as it is called, of strong silk running from the hub to the retreat. The struggling insect causes the web to vibrate, the vibrations are transmitted to the Spider, which rushes down to the web over the trap-line, thus using its telegraph line for a bridge, and seizes its victim. The large yellowish SHAMROCK SPIDER, common in late summer and autumn in rank grass and along the edges of thickets, has a retreat and trap-line of this kind. Many Spiders which rest on their webs have the habit of shaking them violently when an insect strikes the web. This tends to entangle the victim more securely in the snare. There is a small Spider common in shady woods that exhibits this habit to a high degree. It has no common name but is known to scientists as *Cyclosa conica*. It builds a perfect orb-web of wonderful fineness and symmetry. Across the center it makes a vertical band of bits of dirt and the dead bodies of its victims. At the center in this band the Spider waits for its prey, looking much like a bit of dirt itself. If one jars the web slightly the Spider will shake it so violently that it becomes almost invisible. Some orb-weavers, particularly those belonging to the genus *Zilla*, do not make a complete orb, but leave the space between two adjacent radii free from sticky cross lines. This open section is usually on the side of the web on which the trap-line runs to the retreat. These Spiders are very abundant on the sides of houses on the New England coast.

There is a Spider which is not content with merely having an orb-web, but combines with it a tangle of threads on one side of the orb. In this tangle the Spider rests in a silken retreat often roofed over with a bit of dead leaf which has fallen into the web. This is known as the LABYRINTH SPIDER. It is common in woodlands, and usually places its web on the tips of dead branches.

There are a large group of Spiders, known as Comb-footed Spiders, that construct snares consisting of an irregular mass of tangled threads. The commonest example of this type of web is made by the HOUSE SPIDER. Its webs are to be found in corners of neglected rooms, in barns, and sometimes in the shelter of cliffs in dry situations. These Spiders are sometimes known as the COB-WEB WEAVERS. Several species live on the tips of evergreen branches. They construct silken retreats under shelter of the terminal leaves, and the web is attached to the surrounding leaves. In the far South there is a Spider belonging to this group that makes a large web on the ends of the branches of shrubs and trees. These webs are often occupied by more than one Spider. This is our only social Spider. In the tropics there are several species having this habit.

There are many Spiders, belonging to several families, whose snares consist of sheets of silk in which the threads have no regular arrangement. The GRASS SPIDER has a web of this kind. This Spider is extremely abundant in most parts of the country. In the morning when the dew is on them the webs are very conspicuous and seem to cover roadside and field everywhere. Although most abundant on the grass, many of the webs are some distance from the ground on bushes and weeds. The web consists of a broad curved sheet of silk at one side of which there is a silken funnel ending in a tube. In this tube the Spider waits for its prey. Above the sheet there are many threads so placed as to impede the flight of insects and cause them to fall on the sheet. Then the Spider rushes out from her retreat and captures her unfortunate victim. The rear of the tube is open so that in case of danger the Spider easily escapes.

On the face of sheltered cliffs and in cellars are to be found similar sheet webs of Spiders belonging to the genus *Tegenaria*. One of the most beautiful of the sheet webs is that of the FILMY DOME SPIDER, common in cool, shady woods in the Northeastern States. It is to be found on low bushes or other plants, and is so delicate as to be easily overlooked. It consists of a tangle of threads in which is supported an airy dome of wonderful delicacy which in the sun shimmers with a thousand hues. The Spider hangs quietly within the dome until an insect falls on the web, when it is seized, pulled through the roof of the dome and devoured.

A closely related species, the BOWL AND DOILY SPIDER, builds an inverted dome or bowl under which there is stretched a nearly horizontal sheet web. In this case the Spider rests on the under side of the bottom of the bowl and is protected from attack by the sheet below. The HAMMOCK SPIDER is closely related to the last two. It is exceedingly common in shady woods throughout the greater part of the United States and Canada. Its web is found most commonly on herbs and bushes. It consists of a more or less quadrangular sheet web curved in the form of a hammock. The Spider usually uses as a retreat a curled leaf suspended in the web.

There are a large number of Spiders belonging to several families that may be grouped together on the basis of their spinning work. These are the HACKLED-BAND WEAVERS. These Spiders possess, in addition to the spinnerets, other remarkable spinning organs, and the sticky part of their webs is of a complicated and characteristic structure.

Just in front of the spinnerets on the under side of the abdomen is a smooth flat plate covered with hundreds of spinning tubes, known as the cribellum, and on the next to last segment of the hind legs there is, on the upper side, a fine comb of stiff hairs, the calamistrum. The viscid material on the sticky threads in the webs of these spiders is produced by the spinning tubes of the cribellum and is placed on the spinnerets by the comb or calamistrum on the hind leg. By watching one of these at work under a lens one can see the hind leg being moved rapidly back and forth under the abdomen as the thread is spun out.

One of the most interesting of the Hackled-Band Weavers is the TRIANGLE SPIDER. This Spider is common in shady woods everywhere, and spins its web usually on the tips of dead branches. The Spider itself is small, being only one-sixth of an inch in length. Its web, however, is about three or four inches across and can be easily recognized by its characteristic form. It is triangular in shape and consists of four radii or spokes, all of which unite into a single thread before reaching the place of attachment. The sticky cross lines do not merely cross the radii but are applied to them for some distance, giving them a zig-zag course. If one will carefully remove one of these threads and examine it under a microscope it will be found to consist of two parallel threads overlaid by a sticky substance arranged in overlapping lobes. Each lobe is supposed to represent a stroke of the calamistrum when the thread was spun out.*

If one examines the web closely the Spider will be found resting on the under side of the line running from the small end of the web to the support. By examining her under a lens it will be seen that she is holding the web taut and that the slack thread curls between her legs. She holds

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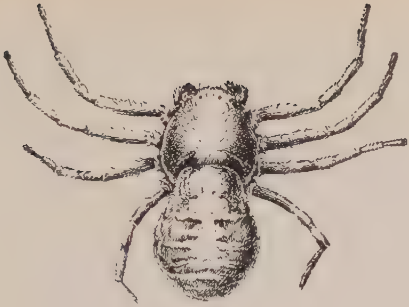
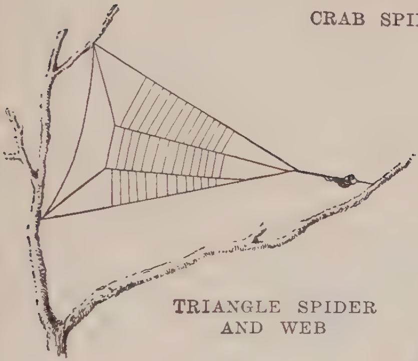
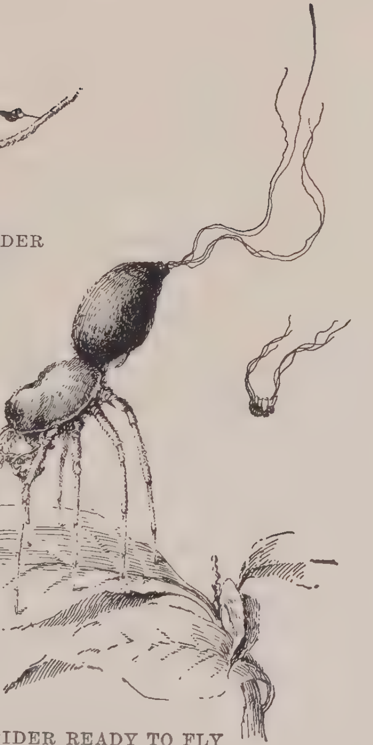
* The best way to procure a bit of web for examination under the microscope is to take a cork and cut off one side so that it will lie still. Then stick two small pins in the end so they project about one-half inch. By touching these pins carefully to the web one can remove a small piece stretched between them. The cork can then be placed under the microscope and the web examined in its fresh condition.



CRAB SPIDER



TRIANGLE SPIDER AND WEB



A BALLOONING SPIDER READY TO FLY

From Drawings by Ellen Edmonson

this position for hours, until an insect strikes the web, when she suddenly loosens the line and shakes the web, thus helping to entangle her prey.

One of the Hackled-Band Weavers also makes an orb-web. This is sometimes known as the FEATHER-FOOT SPIDER, from the tufts of hairs on the front legs. This species is widely distributed throughout the country, but is not an easy Spider to find. It inhabits cool, shady woods, and spins its webs horizontally only a foot or two from the ground on the tips of shrubs. They are often found on the low-growing American yew. The web closely resembles the web of the ordinary orb-weaver, except that the sticky lines are of the hackled-band type. Examined under the miscroscope these will be seen to be similar to those of the Triangle Spider. The Spider will be found resting on the under side of her web. Sometimes the webs will be found decorated with bands or zig-zag ribbons of white silk.

Another hackled-band weaver is to be found under the loose bark of trees and in crevices of the rocks in shady, cool places. This belongs to the genus *Amaurobius*. The Spider is two-fifths of an inch in length when full-grown, brown, with two zig-zag lighter markings on the abdomen. The web consists of a loose irregular sheet or tangle surrounding the opening to the Spider's retreat, and is covered by a network of hackled bands. These bands are beautiful objects under the microscope. First in the central portion are two straight threads; just outside of these there is on each side a fine curled thread, and spread over all is the band of viscid liquid.

The Spiders belonging to the genus *Dictyna* make beautiful hackled-band webs in a number of situations. One species is found abundantly about houses, where it has its retreat in cracks and crevices surrounded by an irregular sheet web covered by zig-zag hackled bands. Other species are to be found on tree trunks and on leaves which they fold slightly. If one examines the heads of dry weeds in neglected fields and along roadways one is sure to find many Dictyna webs in which the hackled bands are carried back and forth between parallel supporting threads so as to give the web a ladder-like appearance. In the South there lives a remarkable spider, *Filistata*, which is common on the sides of houses and under stones. The webs are conspicuous on the sides of houses; they are nearly circular, and surround the entrance to the Spider's retreat. At first glance the web seems to be a mere tangle of threads loaded with dust and dirt, but careful examination will show its wonderful complexity and the beauty of its structure. In order to have a clean web for study it is well to remove the old web; usually the Spider will replace it with a new one during the night. A still better method is to capture the Spider and confine it in a box about the size of a cigar box.

leaving a single opening in one side a little larger than the Spider. Usually the Spider will make itself at home in its new quarters and spin a fresh web the first night. If the box is painted black the web will show up nicely against this background.

In spinning its web, the Spider first surrounds the opening with a loose network of threads. Then from this central part she stretches radiating lines extending some distance from the opening. These lines are double, for in spinning them she begins at the center, and on reaching the proper distance fastens the thread to the surface and returns to the starting point. After the double line has been placed in position the Spider places on it a hackled band. To appreciate its beauty it should be seen under the microscope. The completed thread consists first of all of the double thread described above; this thread is inelastic and serves to transmit vibrations to the Spider hidden in its retreat. On it are two fine extremely elastic threads which are arranged in large loops. These are the primary looped threads. Attached to each of them there is another looped thread, the secondary looped thread, and the whole is covered with a band of viscid liquid.

Not all Spiders construct snares for capturing their prey. The CRAB SPIDERS are assassins that lie in wait for their victims. Some of them frequent flowers, their colors blending with those of the blossoms. Insects that visit flowers for nectar or pollen fail to notice their enemy till too late. They are seized, and a skillful bite with the Spider's poison fangs in the neck quickly causes paralysis.

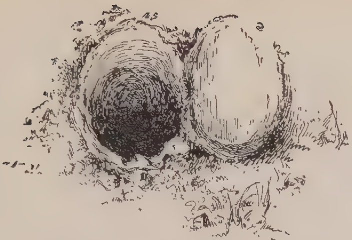
The JUMPING SPIDERS, the WOLF SPIDERS, and the NURSERY-WEB WEAVERS obtain their food by the chase.

Spiders also use their silk for the purpose of ballooning through the air. This habit can be most easily observed on warm, sunny afternoons in October or November, when there is only a very light breeze blowing. On such days many young Spiders and the adults of the smaller species climb to elevated positions such as fence posts and the tops of weeds; they elevate the tip of the abdomen and spin out a fine thread which is caught by the wind and carried upward by the rising air currents. When the thread is long enough to support its weight the Spider loosens its hold and floats away through the air to find a new place of abode. Sometimes when the weather is just right for ballooning, the air becomes filled with the webs, which when viewed toward the sun appear like a glittering haze. If the wind is too strong, the threads, instead of being carried upward, are merely swept to other objects. Under such circumstances plowed fields may become covered with a delicate carpet of silk, and viewed against the sun appear like the waves of a gossamer sea.

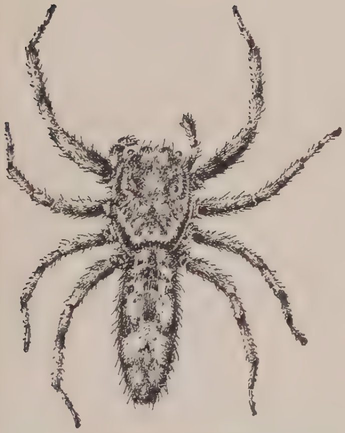
There are a number of Spiders that live in burrows in the ground;

most of these belong to the group of the Tarantulas. Among these are the famous Trap-door Spiders of the South and Southwest. The architecture of some of these Spider homes is truly remarkable. The simplest form consists of a burrow the opening of which is closed by a thin, silken, wafer-like door. In the higher types the door is thicker and the edges are beveled to fit snugly into the opening of the burrow. On the inside of the door near the edge farthest from the hinge there are two little holes in which the Spider places its claws when it wants to hold the door shut. When the door is closed it is very difficult to locate the burrow. as the outer surface of the door is covered with dirt like the surrounding soil. If the burrow is placed where mosses are growing, the Spider plants bits of the moss on the door as an added and very effective means of concealment. Some Trap-door Spiders have two doors, one at the

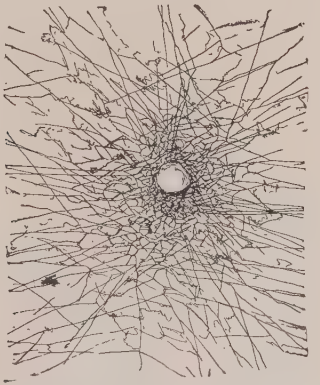
TARANTULA



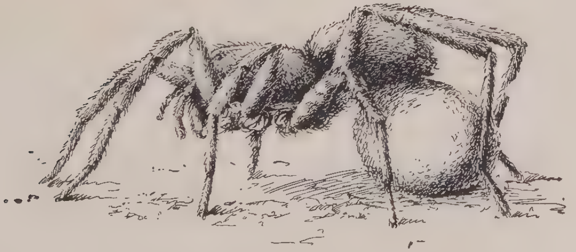
OPENING OF THE RETREAT OF
A TRAP-DOOR SPIDER



JUMPING SPIDER



WEB OF THE SOUTHERN
FILISTATA



RUNNING SPIDER AND EGG SAC

From Drawings by Ellen Edmonson

surface and the other some distance from the opening. In some species the burrow, instead of being simple, is branched, the branch running back nearly to the surface of the ground. Sometimes the opening to the side branch is protected by a door. The purpose of these branched burrows seems to be to aid the Spider in escaping from a pursuer. In the Southeastern States there is a rather common Trap-door Spider which is peculiar in that the trap-door is composed of two valves like a double door.

The PURSE-WEB SPIDER is a small Tarantula found in Florida, Georgia, and northward to Virginia. This Spider constructs a shallow burrow, usually at the base of a tree, which it lines with silk, and then continues the lining upward along the base of the tree trunk and a tube to the height of nearly a foot. The top of the tube is securely fastened to the bark and the bottom to the edges of the burrow. It is thus stretched tightly and is set in vibration if an insect alights on it. The surface of the tube is covered with bits of dirt and lichens so that it closely resembles the bark of the tree. When an insect alights on the tube the Spider bites through the wall of the tube and then pulls its victim through the rent or tear, which is afterward repaired.

Not all the burrowing Spiders are Tarantulas. Several species of the Wolf-spiders have this habit. One of these, PIKE'S LYCOSA, is very abundant on the sand dunes along the Atlantic coast. The burrows are six to eight inches in depth, and the opening is unprotected by a door. One can easily dig the Spiders out of the sand, and will often find the female accompanied by her young.

There are several species of Wolf-spiders which inhabit burrows and surround the opening with a turret of small pieces of twigs, bits of grass, or small stones or grains of sand. This turret may be an inch or more in height, and is used as a watch-tower while the Spider is awaiting its prey.

COCOONING HABIT AND THE CARE OF THE YOUNG

ALL our Spiders lay their eggs in masses and inclose them in silken cocoons of various kinds. Some are so delicate that the silk is easily overlooked and the eggs seem to be merely stuck together. Others construct elaborate coverings for their eggs. If adult Spiders are carefully collected without injuring them and brought to the house or garden it is often possible to have them spin their cocoons or egg-sacs under observation. This is especially the case with some of the larger orb-weavers. The Shamrock Spider constructs a soft, delicate egg-sac through which the eggs can be readily seen. The Orange Garden Spider incloses its eggs in a cup of silk; this is surrounded by a mass of flossy silk and the whole is inclosed in a tough brownish silken covering and anchored by many strong threads into the top of some dead weed or bush. The Banded Garden Spider makes a characteristic egg-sac, shaped like a round-bottomed kettle with a flat lid. The building of this egg-sac can be readily observed in confinement. The Spider makes the lid first, fastens the mass of eggs beneath it, and then covers it with the kettle-shaped part.

Some Spiders suspend their egg-sacs in their webs. Some fasten them to twigs by stiff threads and others make flat lens-shaped cocoons which are attached to the under side of stones. The Wolf-spiders make spherical or flattened egg-sacs which the females carry with them attached to the spinnerets until the young emerge. When the young leave the egg-sac they climb to the mother's back and remain there for some time. These Spiders are very common in pasture fields and along the edges of woods. It is very easy to find the females carrying their egg-sac, and if one is fortunate enough he may observe one with her whole family on her back, acting as a living baby-carriage.

The Nursery-web Weaver carries her large spherical egg-sac in her jaws till the young are nearly ready to emerge, when she suspends it in the top of some weed or shrub and then weaves together the leaves about it to form a nursery for the young spiderlings. She then remains on guard till they are able to take care of themselves.

THE FAMILIES OF SPIDERS

THE twenty-five hundred or more species of Spiders known to inhabit America north of Mexico are divided into thirty families. Some of these families are represented by only one or two species or are very rare. These are omitted from the present account.

The Tarantulas. These large, heavy-bodied Spiders may be distinguished from all others by the fang of the jaw, which moves vertically instead of sidewise. They also have four book-lungs or breathing organs. Many of them inhabit burrows. To this family belong the Trap-door Spiders.

The Hackled-Band Weavers. In this group are included six families characterized by having the *cribellum* and *calamistrum*, and in weaving a hackled-band in their webs.

The Drassids. This family contains a large number of species which may be recognized by having only two claws on each foot and by having the front spinnerets separated from each other. Their eight eyes are arranged in two rows. They are found under stones and loose bark.

The Clubionids. In general appearance these Spiders resemble the Drassids, but they have the front spinnerets close together. They are found in tubular nests in rolled leaves, under bark and in leaf-mold.

The Crab-spiders. Members of this family are easily recognized by the first and second pairs of legs, which are longer and stouter than the others and directed forward, giving them a crab-like appearance. They also resemble crabs in walking sidewise. They are to be found on flowers, leaves, the trunks of trees, and in the dead leaves in the woods. They are sometimes abundant on sidewalks.

The Tunnel-web Spiders. These Spiders have eight eyes arranged in two rows. The legs each bear three claws. The hind spinnerets are longer than the others. Members of the family spin sheet webs usually connected with a funnel. The Grass Spider is our commonest representative of this family.

The Wolf-spiders. These Spiders have the eyes arranged in three rows; four in the first and two each in the others. They are hairy Spiders of dull colors, abundant everywhere. They run with great rapidity and capture their prey by the chase.

The Nursery-web Weavers. These Spiders closely resemble the Wolf-spiders, but their eyes are arranged in two rows. Their habits are described elsewhere.

The Comb-footed Spiders. These Spiders have on the under side of the last joint of the hind legs a comb of curved, toothed, stiff hairs. This is used to throw silk over their prey. They construct irregular webs of silken threads. Our House Spider is the commonest member of this family.

The Orb-weavers. Members of this family are most easily recognized by their webs. The construction of these webs has been fully described.

COLOR AS SEEN IN THE ANIMAL WORLD

By JENNIE ARNOLD MEDSGER

PROTECTIVE COLORATION, FORM, AND MIMICRY

ALL students of Nature have noticed—as, in fact, has even the most casual observer—that many animals are so formed or colored that when in their native haunts they are often unobserved, therefore unmolested.

Mother Nature quite truly safeguards her children. If not armed with sharp teeth, claws, stings, or other weapons of defense, she gives them a means of concealment as protection from their natural enemies.

John Burroughs in his essay entitled "Gay Plumes and Dull" expresses a doubt as to the uses of color in birds and animals,* but it is a generally accepted theory that color and form do act as a protection, and are not simply accidental. They are the result of the survival of the fittest, and "by natural selection and heredity those variations or conditions that give animals advantages in the struggle for life are preserved and emphasized."

One can see many examples of protective coloration. The birch-bark moth can scarcely be distinguished from the mottled bark of the birch tree. The luna moth, with its beautiful pale green wing, is safe among the leaves, where it stays during the daytime. As you walk along the dusty road you do not see the dust-colored grasshopper until it flies up before you; then the eye follows the bright yellow bands on the wings, but only for an instant, for its flight is short and it again alights with folded wings and is lost. A bird would no sooner get its eye on the wings as a target when it would disappear and be the color of the dusty road. In the field the grasshoppers are green and are again unnoticed until disturbed.

The tree-hoppers are safely protected among the green foliage, and the green katydids are scarcely even seen among the leaves, and would be little known except for the familiar note of the male.

Many of our butterflies are colored so much like the flowers they visit that when resting quietly on the blossom they seem like a part of it.

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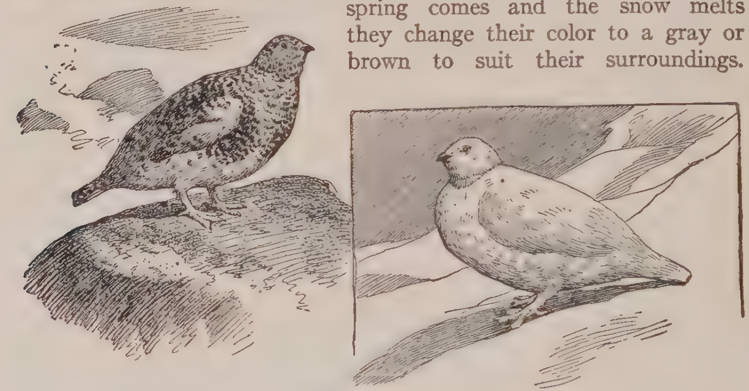
* Mr. Burroughs says: "That there is a measure of truth in it, I am convinced, but that it has been greatly overworked in our time, and that more has been put upon it than it can bear, of this also I am convinced." G. C. F.

Fishes are dark above and light underneath;—to the birds or other enemies that look down on them from above they resemble the bottom; to their fish enemies who see them from below they look like the light sky above them, and their forms are not easily distinguished.

In the Arctic regions the polar bears, arctic foxes, and hares are white, like their snowy surroundings. The animals of the desert are sand-colored. The fishes of the tropics are brightly colored, like the brightly colored sea-weeds.

Some animals change their color to fit their surroundings. Certain hares that live in northern latitudes are wholly white in winter, but as spring comes and the snow melts they change their color to a gray or brown to suit their surroundings.



PTARMIGAN

(Summer plumage) (Winter plumage)

The ptarmigan, a grouse which lives in the Rocky Mountains, is white in winter, and as spring comes it changes its plumage to brown and white, like the snow-flecked rocks; and finally as the season advances it is wholly a mottled brown.

The weasel of the northern States and Canada changes its color in winter to pure white, except the tip of its tail; this is black. Stone and Cram in their "American Animals" say: "If a hawk or owl, or any other of the larger hunters of the woodland, were to give chase to a weasel and endeavor to pounce upon it, it would in all probability be the black tip of the tail it would see and strike at, while the weasel, darting ahead, would escape."

Animals that are so protected by coloration often freeze or remain perfectly motionless, realizing that their hope of safety lies in their becoming as nearly as possible a part of their surroundings. Rabbits and hares are familiar examples of this.

One of the finest illustrations of protective coloration that has ever come to my attention was a nighthawk on the limestone rocks in an old stone-quarry in northern New York. The mother bird was sitting on the eggs, which were laid on broken pieces of rock, for they build no nest. I almost stepped on her before she flew, so like the color of her surroundings was she that I did not see her. The eggs were also mottled and hardly noticeable among the rocks. I carefully watched the brooding night-hawk, and when the young were hatched secured a photograph. The young birds were so nearly the color of the surrounding rock that it was amost impossible to see them in the picture. In order to show a lantern slide on the screen I had to paint the birds a darker color.

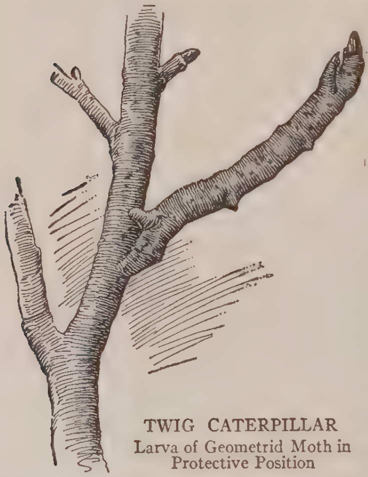
Toads, frogs, and snakes are all good examples of protective coloration. The green grass snake glides unnoticed through the grass, the milk snake is mottled brown and white, like patches of light and shade. The green of the frogs is the same as their surroundings, and the common tree-toad is like the bark of the tree on which it rests.

Kellogg in his "Animal Studies" tells of a small insect called the toad-bug which is found abundantly in California. On the shores of a pond on the campus of Stanford University, he says, are found different colored rocks, some being red, some bluish, some sand-colored. Specimens of the toad-bug found on the red rocks are reddish, on the blue rocks bluish, on the sand are sand-colored. Such changes of color to suit their environment are quickly made by some animals. The chameleons of the tropics are excellent examples of this; so also is the small lizard of our Southern States, called from its habits the Florida chameleon. Our boys once had one of these lizards, and it lived for months on a large fern in the living room. When on the fern it would be a beautiful green. When it would leave the fern and crawl up the tan-colored window shade it would become tan colored. Once I remember we looked for it for hours, and finally found it stretched out on the rocker of a dark oak chair. It had changed to a dark brown so nearly the color of the chair that it could scarcely be seen.

There are so many illustrations of protective coloration that it is impossible to mention all, and every nature student will find for himself many interesting instances.

Perhaps more striking than color protection is protective resemblance. In this the animal resembles in form and color, sometimes very minutely, some particular object or part of its environment.

Even the sharp eyes of birds cannot easily distinguish the twig caterpillar from the real twig. At the slightest indication of danger, he holds his body rigid, standing out from the branch at an angle with it and holding on with the posterior prolegs or false-legs. The absence of any legs except at both ends of the body add to the deception. His skin is brown and green, scarred like a leaf-scarred twig. So remarkable is this resemblance to a broken twig that I have stood beside one of these caterpillars and not noticed the deception until I touched the supposed branch. In fact, I once found one on the trunk of a tree and went to get my camera to photograph it, and when I returned had to look for some time before I could find the caterpillar.



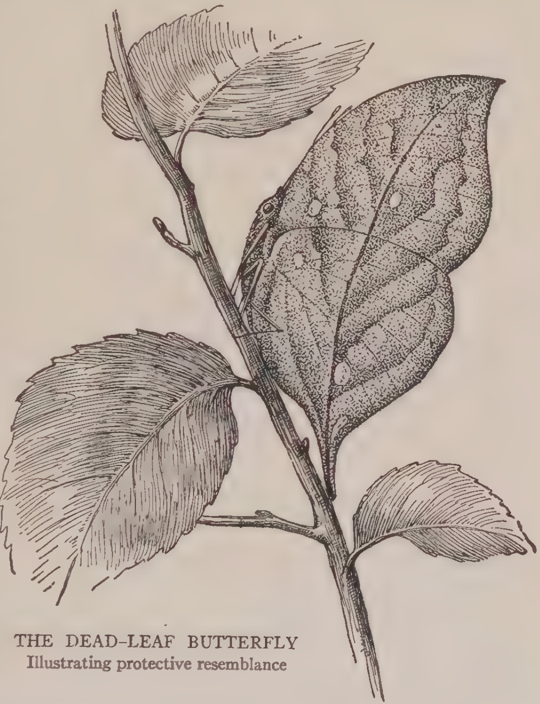
TWIG CATERPILLAR
Larva of Geometrid Moth in Protective Position

Another striking example of protective resemblance is the walking-stick, whose long, wingless, stick-like body lying along the limb or trunk of a tree can scarcely be recognized. The bodies of the young are green and are apt to be found on the leaves; as they grow older they more closely resemble the brown branches. Hancock in his "Nature Sketches" shows a photograph of a young walking-stick on the under side of an oak leaf. Its body is on the mid-rib of the leaf, and its thread-like legs look like the veining of the leaf. He says that he finds when disturbed they always seek the under surface of leaves, where they can scarcely be seen, or they fall to the ground and remain motionless. One under observation remained in the same position for six hours, feigning death perfectly.

The leaf-butterfly of India is a most striking and perfect illustration of protective resemblance. The upper sides of the wings are purplish and orange, not at all like a leaf. But when at rest on a branch it holds its wings together so that only the under sides of them are seen. Then the butterfly looks exactly like a dead leaf, with markings imitating the mid-rib and veins. Specimens of these butterflies may be seen in the museums of natural history.

Many of our native butterflies, though not as exact a reproduction, look much like a brown leaf with notched-edged wings resembling the serrated edge of the elm or birch.

Some animals are so colored and formed that they are afforded protection thereby, while in many cases certain form and color enable them to more easily catch their prey. The latter condition is called aggressive and alluring coloration or form. The stripes of the tiger resemble the shadows of the bamboo; the leopard's spots, the shadows of the leaves—enabling them to slip up quickly on their prey. Snakes are aided by their colors to capture their food. Alligators and crocodiles lie motionless like great logs in the water waiting for a victim. Many spiders are colored like the flower cups they inhabit, and when the insect comes to the flower for nectar it is captured. Search in the blossoms of the evening primrose for the yellow spiders that lie in wait for the insects that come in the night when the flower opens. You will not only find the spider, but the dead bodies of its victims as well.



THE DEAD-LEAF BUTTERFLY
Illustrating protective resemblance

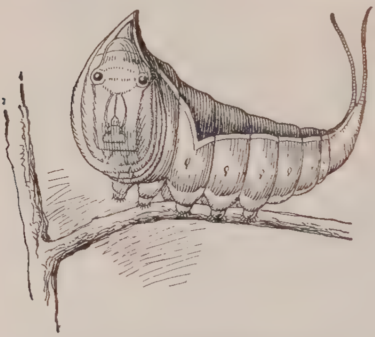
As an illustration of alluring coloration, there are certain fly-catching birds of Brazil whose crest resembles a flower cup. Flies mistake it for a real flower, and form the food supply of the bird. A lizard of Asia is sand-colored like its surroundings, except for red folds of skin at the corners of its mouth, resembling little red flowers that grow in the sand. Insects attracted by the supposed blossom find out their mistake too late.

The angler-fish has the front rays of the dorsal fin prolonged, the extremity of which is divided and looks like a worm. The fish hides in the coral reefs and waves this back and forth. Small fishes think it a worm and are drawn down into the angler's wide mouth.

Again, some animals that are harmless try to frighten their natural enemies by terrifying appearances or behavior. The large green caterpillars of the sphinx moths have a formidable-looking horn on the back of the next to the last body-segment. When disturbed they rear up the hinder part of their body and move it about in a threatening manner. In reality it is harmless.

The caterpillar of the tiger swallowtail butterfly has a peculiar looking false face with eye-spots, and a ridge that resembles a mouth. These are on the third and fourth segments of the body, and when disturbed he draws in his real head and the false mask presents a most terrifying appearance to the bird enemies, who have been observed to take one glance and fly away in alarm.

The larva of the puss-moth is often referred to as an example of terrifying appearance. It, too, has eye-spots, black and conspicuous, in the appropriate place for eyes. A red ring which is inflated separates the supposed head from the rest of the body, and when disturbed it draws in the real, inconspicuous head, and presents this large flat-looking face. Besides this face it has two whips which are protruded from the prongs of the fork in which the body terminates. These he brandishes in a threatening manner. The Io moth as it hangs suspended from a branch looks like the surrounding shrubbery of dead leaves, but when disturbed displays the two big eye spots on the under wings. This may be either to frighten away enemies or to act as a target for night-flying birds, who would pierce the eye-mark instead of the soft body of the moth. One naturalist states that he has often found the Io moths with their wings pierced in this manner.



LARVA OF PUSS-MOTH, WHEN DISTURBED

Many of our animals possess what have been called warning colors, that is, they are brightly colored for protection or as a warning to their enemies to be let alone. These animals are supposed to have an acrid taste.

The brightly colored lady-bugs and potato-beetles are rarely eaten; many caterpillars are never molested by the birds.

We had a blue jay who had fallen from the nest. He became tame and stayed with us the whole season. We tried feeding him different caterpillars to see if there was any truth in the statement that some caterpillars are immune from the attack of birds. Some he would eat greedily, with others he would cock his head on one side, eye suspiciously, and let alone. Evidently some natural instinct told him the proper food for a blue jay although he had no mother to teach him.

The most striking and beautiful butterflies flit about, seemingly realizing their safety.

Bees and wasps are conspicuous, but are known to be able to defend themselves, so are rarely molested.

Most toads are colored like their surroundings, but one naturalist describes a brilliant tropical species dressed in red and blue, that hopped about fearlessly in the daytime. He captured some and tried to feed them to his ducks, but they would not touch them. He had imagined that this would be the case from their bright color.

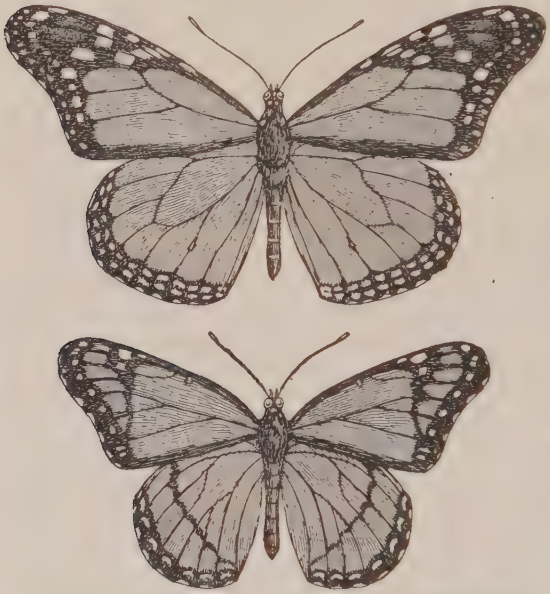
Protective mimicry is the result of a slow process of development, which undoubtedly has gone on for ages, by which one animal takes on the form and appearance of another. In this manner an animal naturally unprotected may take on the form and habits of another who is protected, and thereby be immune from the attack of species which ordinarily prey upon it.

Who is there who has not been deceived by mistaking the robber-fly for the bumble-bee? One author says, "If I were to select a perfect example of mimicry in our temperate latitude, this insect might be chosen as the highest type." So closely does it resemble the bumble-bee as it flies about, that only by observing its habits can one distinguish it. But if you will watch it for a while it will reveal its identity by capturing an insect on which it feeds. The real bee lives on the nectar from the flowers. If this imitator is examined closely he will be found to have but one pair of wings instead of two, as all bees have. Some authors state that this fly is not always immune from the attack of birds, but most observers agree that he enjoys the freedom experienced by the bee without having the sting. For he is perfectly harmless. This protection has probably come about for the preservation of species, which would otherwise become extinct.

The mimics are always fewer than the ones imitated. It is more often found that females are more liable to be protected in this way than males. This is probably on account of their slow movements, when laden with eggs; and exposure, when depositing them.

I happened into a classroom not long ago and the whole room was disturbed over the presence of a supposed bee. It was in reality only a fly which closely resembled the honey-bee. The one pair of wings instead of two was the only good way to distinguish it from the bee. So one can easily see how the birds would be deceived.

The Monarch and Viceroy butterflies, two common showy species, are almost never molested. One, the Monarch, is provided with a pouch on the hind wing, containing scent scales, which are distasteful to their natural enemies. The Viceroy has no such protection, yet resembles the Monarch so closely that it, too, is let alone.



VICEROY BUTTERFLY (below), WHICH MIMICS THE MONARCH (above)

It is very difficult for birds to capture a butterfly. So one can realize that after a butterfly is finally taken and found distasteful, no more time is wasted in such endeavor, and the butterfly that so much resembles the unappetizing one is rarely captured.

Only the adult butterflies of these two species resemble each other, the eggs, caterpillar, and pupa being very different.

The striking colors of the male of many of our animals, especially birds, are supposed to be useful in attracting a mate. The male must win his mate. It is a question of the continuation of the species. These are called signal colors. I watched the courtship of a little brown house wren this spring, and he did have to dance around and strut and sing for a long time before he could get his intended mate to look into the box that he had chosen to be their home. Perhaps, had he been more brightly colored, she would have been more easily won. The demure colorings of the females act as a protection while sitting on the nest.

Color in animals is indeed a study worthy of thoughtful consideration and observation. Many interesting specimens may easily be found and studied. The conclusion is that color in some animals serves either to protect them from their enemies or to help them capture their prey.

BIRD HOUSES AND SHELTERS

TABLE OF BIRD HOUSE DIMENSIONS

Kind of Bird	*Floor of Cavity*	*Depth of Cavity*	*Entrance above Floor*	*Diameter of Entrance*	*Height above Ground*
Bluebird	4 x 4	8	6	1½	5 to 15
Chickadee	3½ x 3½	8	8	1½	6 to 15
Flicker	7 x 7	16	16	2½	10 to 25
House Finch	6 x 6	6	4	2	8 to 12
Martin	6 x 6	6	1	2½	12 to 20
Nuthatch	3½ x 3½	10	8	1¼	12 to 20
Owl, Barn	10 x 18	18	4	6	12 to 18
Owl, Screech	8 x 8	15	12	3	10 to 30
Phœbe	6 x 6	6	open		8 to 12
Robin	6 x 8	8	open		6 to 15
Sparrow, Song	6 x 6	6	open		1 to 5
Swallow, Barn	6 x 6	6	open		8 to 20
Swallow, Tree	4 x 4	6	6	1½	10 to 15
Wren	3½ x 3½	6	6	1	6 to 10
Woodpecker, Red-headed	6 x 6	15	12	2	12 to 25

Adapted from the United States Department of Agriculture.
The first four columns are in inches, the fifth in feet.

HOUSES AND SHELTERS

BY RALPH F. PERRY

IF you have even a little patch of yard, particularly if there is a tree in it, or a vine on the house, or on a trellis, you may hope to have a tenant for a bird-house. An orchard or a strip of woods is the very best place to set your nesting-boxes, of course, but many do not have such places. The possible occupants of your house will depend upon the section of the country where you live, and whether in town or country, woods, prairie, or seashore. Bluebirds, tree swallows, purple martins, wrens, flickers, downy, hairy, and red-headed woodpeckers, fly catchers, screech and barn owls, chickadees, and nuthatches like to build their nests in cavities, boxes, or houses; and robins, barn swallows, catbirds, phœbes, brown thrashers, and song sparrows will very often make use of a shelf or open shelter. So if any of these are seen around your home, set up a suitable box or shelter, and see if you cannot induce them to accept it for a nesting-site.

The beginner should be warned that "fishing" for birds this way is quite like the other fishing in pond or river. Birds are just as whimsical and as different in their likes and dislikes as people are. To explain why a well-built and properly erected bird-house is unoccupied, especially when last year it was used, is as difficult as it is to explain why we come home from a fishing trip empty-handed, when we took every care in preparing and handling the tackle. In some localities birds seem to prefer a carelessly built house with cracks for ventilation, but elsewhere a snug, tight box with no opening except the entrance door is the only one that will be occupied. Some folks say we ought to hang all nesting-boxes so as to keep out our great bird-pest, the English sparrow, but the sparrows nevertheless often build in a swinging nest; and on the other hand, some of our choicer birds seem to object to a box that is not fastened up securely. People also have different ideas as to the addition of roosts or perches. Therefore we can only provide such a house as we have material and ingenuity to build and erect, compare our results in the way of occupation with what our neighbors accomplish, and if we do not at first succeed, have patience, and try again.

Cedar or cypress and white pine are easily worked, and will weather well, and rough boards are better than those of smooth planed stock. Paint of a neutral gray, green, or brown, particularly if allowed to weather for a couple of months before nesting-time, probably never kept any bird from an otherwise satisfactory nesting-box, and of course it will preserve your handicraft for many a year. Martins are different in many ways from all other bird tenants, and their houses may be painted white.

Improvised Bird-Houses

Bird-houses can be divided into two classes: those we find ready-made, or nearly so, and the made-to-order kind. Any of the medium or larger-sized tin cans in which our canned foods come can be easily made into suitable houses if we take a little care. It is best to cut out the cover entirely, and fasten in a board cut to fit in its place, and then cut or bore a hole for the entrance. The can is now ready to be fastened up in a horizontal position. Or a U-shaped cut may be made in the side of the can near the bottom, the flap thus made bent out to form a rain-hood, and the can turned over bottom-up, and fitted on top of a post and nailed there. All nests should have a little hole in the lowest part to let out any rain-water that beats in. Tin-can houses should either be painted or erected in the shade, so that the sun will not make them too hot for the mother-bird while she is "setting," and since they are such cheap affairs they should be destroyed at the end of each season, and new ones put out next year, lest a worn-out rusty one come tumbling down with some little family.

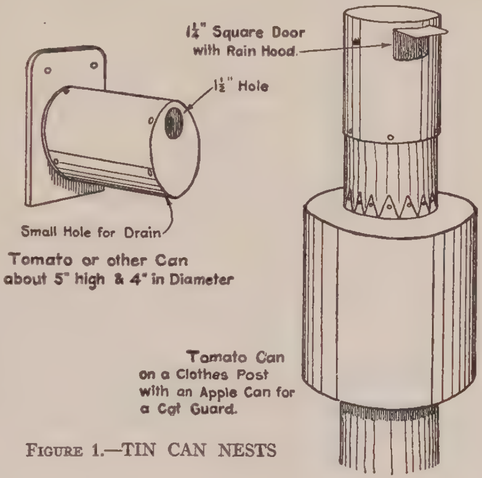

1¼" Square Door with Rain Hood
1½" Hole
Small Hole for Drain
Tomato or other Can about 5" high & 4" in Diameter
Tomato Can on a Clothes Post with an Apple Can for a Cat Guard.

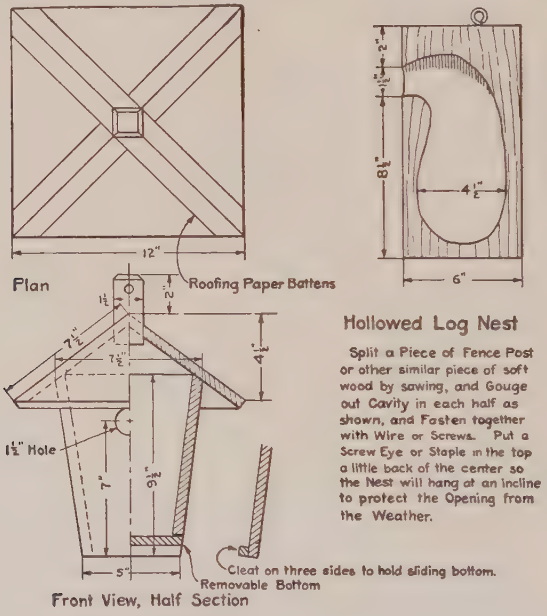
FIGURE 1.—TIN CAN NESTS

Small wooden boxes that starch, school crayons, or other small wares come in may be quickly made into nesting-boxes by simply cutting or boring a hole an inch and a half in diameter high up on one side. These make very serviceable houses, but do not look well. Sometimes when a tree is cut down, a limb with a woodpecker's or bluebird's old nest is found, or perhaps just an old knot-hole that makes a cavity three inches or so in diameter and six inches deep. A piece of the limb with this cavity in it can be cut out and tied up in some other tree.

In the warmer parts of the country where gourds grow, these may be used. Another thing that you can sometimes find is an old pump-log, or the end of a built-up veranda-post. A plug may be driven in one end, or a board nailed on for the bottom, and the other end sawed off slant-wise and covered with a larger board for the roof.

MADE-TO-ORDER BIRD-HOUSES

Designs for bird-houses are as varied as our own habitations, some simple, others elaborate, a single family bungalow, or a forty-suite apartment house. One of the simplest and most natural is the hollowed log shown in sections at the right in Fig. 2. To make this type of house for a bluebird



Front View, Half Section

Square, Hanging Nest

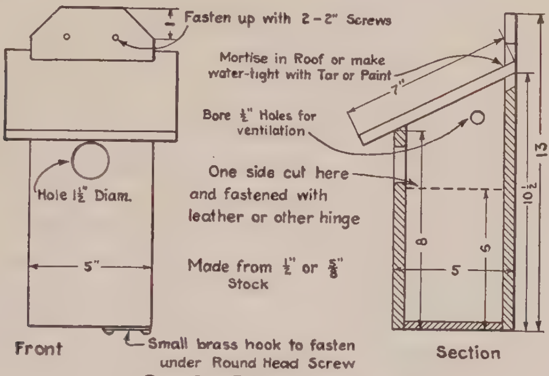
Hollowed Log Nest

Split a Piece of Fence Post or other similar piece of soft wood by sawing, and Gouge out Cavity in each half as shown, and Fasten together with Wire or Screws. Put a Screw Eye or Staple in the top a little back of the center so the Nest will hang at an incline to protect the Opening from the Weather.

FIGURE 2

or swallow, obtain a 12-inch piece of cedar fence post or other similar straight-grained wood, about 6 inches in diameter, and saw it in two, length-wise. Then with a gouge, hollow out, as shown in Fig. 2, wire together, or fasten with brass screws, put a staple or screw-eye in the top, and your cavity is done.

The accompanying drawings show several typical forms, one to hang in a tree, one to fasten to the trunk of a large tree, or to the side of a building. In the first case (Fig. 2) the bottom is made removable from the side, grooves being provided in the walls for it. The side of Fig. 3 is hinged so that you can open it to clean it out. In this connection it might be noted that a nesting-box with a hinged cover, fastened outside your window, will permit you to learn a great deal about the family life of your tenants. By being quiet and deliberate in your movements they will not be frightened by the opening of this, so you can look in on them from time to time.


Fasten up with 2-2" Screws
Mortise in Roof or make water-tight with Tar or Paint
7"
Bore ½" Holes for ventilation
Hole 1½" Diam.
One side cut here and fastened with leather or other hinge
Made from ½" or ⅝" Stock
5"
13
10½
8
9
5
Small brass hook to fasten under Round Head Screw
Front
Section

Box for Bluebird or Swallow
Make twice this size for Screech Owl
FIGURE 3

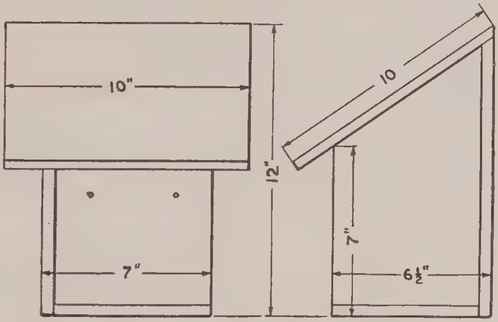


FIGURE 4.—NESTING SHELTER FOR PHŒBE

Some birds, such as robins, phœbes, barn swallows, and several others, which cannot be induced to live in a box or cavity, will readily use a shelf or open shelter. Just a plain board, 6 to 8 inches square, nailed up under a porch roof with 8 or 10 inches of open space above it, will frequently be taken by a robin or perhaps a phœbe. An open-sided box of four boards, as Fig. 4, or a rustic one like Fig. 5, is quite easily made, and has proved to be popular with these birds.

If martins are common in your vicinity, of course you will want a martin house. These are about the only birds that like to live in apartment houses, and the building of a good one is not easy. Fig. 6 shows a fairly simple building of this kind that can be made as many storeys high as is desired. Each storey fits down inside of the frame formed by the perches, and can be easily removed for cleaning. It should be mounted on top of a stout pole, in the middle of a fairly large open yard.

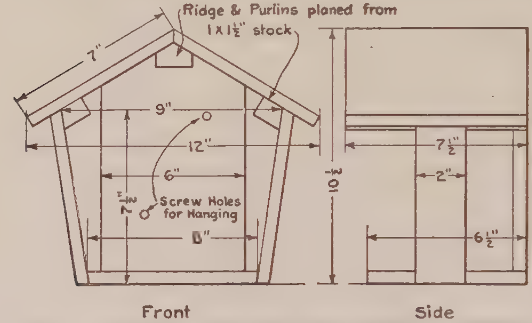


FIGURE 5.—NESTING SHELTER FOR ROBIN OR PHŒBE

This is very attractive in appearance if made rustic style, from slab wood

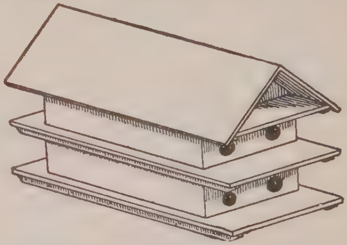
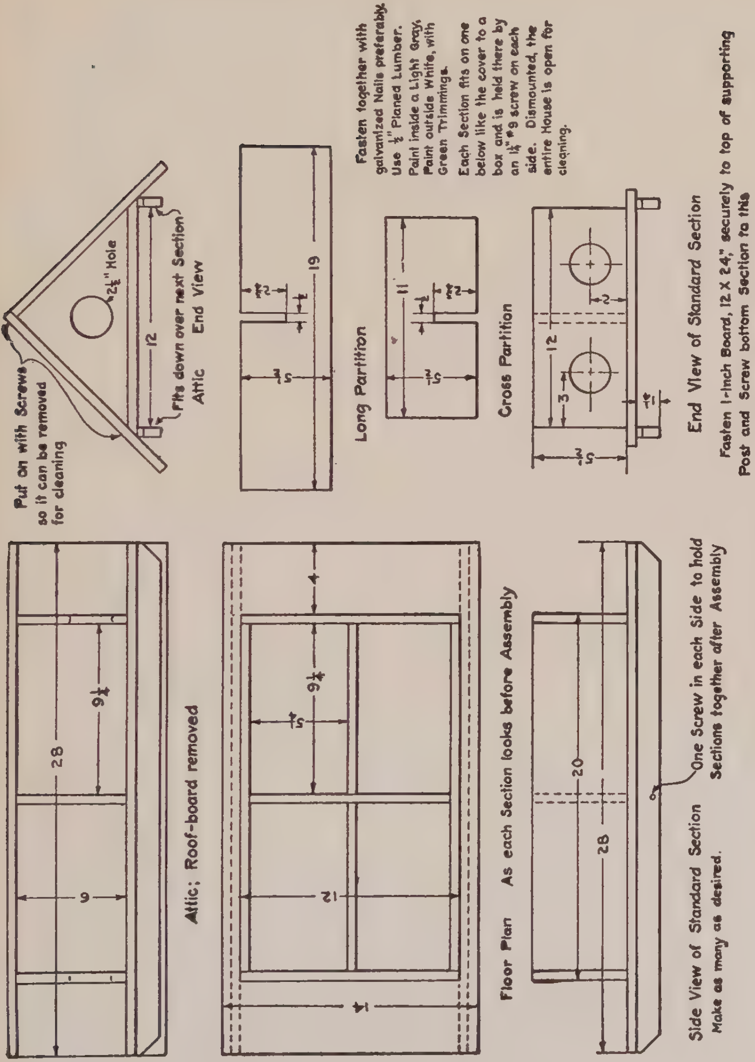


FIGURE 6 B.—TWO STOREY MARTIN HOUSE ASSEMBLED

FEEDING-BOXES

After you have learned how to help the birds in their house-building, you will naturally wish to help them find a living, and to do that you must put up a feeding-box. A plain board



Put on with Screws so it can be removed for cleaning

Fits down over next Section

Attic End View

Attic; Roof-board removed

Long Partition

Floor Plan As each Section looks before Assembly

Cross Partition

Fasten together with galvanized Nails preferably. Use ½" Planed Lumber. Paint inside a Light Gray, Paint outside White, with Green Trimmings.

Each Section fits on one below like the cover to a box and is held there by an 1¼" #9 screw on each side. Dismounted, the entire House is open for cleaning.

End View of Standard Section

Fasten 1-inch Board, 12 X 24," securely to top of supporting Post and Screw bottom Section to this

Side View of Standard Section Make as many as desired.

One Screw in each Side to hold Sections together after Assembly

FIGURE 6 A.—MARTIN HOUSE OF UNIT SECTIONS

mounted on a fence-post or clothes-post upon which you can put table-scraps, crumbs or sweepings from the grain-room in the barn, is the simplest, but the food is too easily scattered off this, and in bad weather, when the birds need it most, it is spoiled. A little box with sloping sides and open bottom, with a tray close under it, is quite easily made. It is filled with grain or crumbs by lifting the hinged cover, and the food runs out on the tray a little at a time as the birds eat it. Nail this up on the sheltered side of a tree, and never let the box get empty nor clogged up. When you set up nesting-boxes, you are just helping the birds, and you are not promising them anything more than to protect them from their enemies, the cat, the boy with the air-gun, or the man who "collects" bird's eggs. But when you put up a feeding-box, and keep it up after most of our birds start South for the Winter, you are promising them if they will stay with you, and not take the long, dangerous flight to a warmer country, that you will help them find food to eat through the Winter. In skating-time, and coasting-time, and during storms, you must keep that promise, and see that the birds can always find food on their pantry

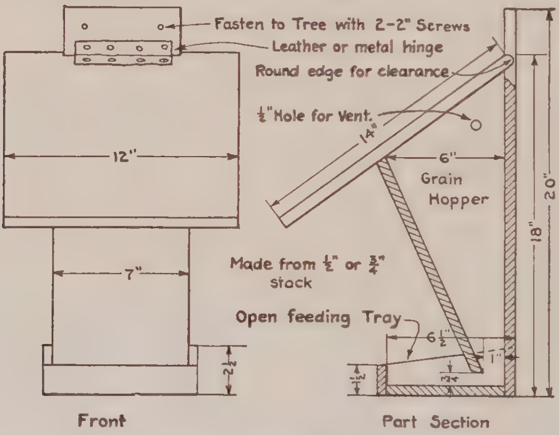


FIGURE 7.—FEEDING STATION

shelf. Larger feeding-boxes that have glass sides, and those that swing with the wind like a weather vane, so that the shelf is always protected, are very good, but are too much for most boys to try to build.

Erection and Care

Nesting-boxes may be set up on poles or posts, on brackets fastened to the house or barn, or in trees. They should be put on the side of buildings or other shelter, away from the usual storms. If set in trees, they should not be in too dense a shade. Those set up on poles or fence posts should, for a part of the day, be in the shade of a tree or building. Too many bird-houses should not be crowded into a small yard or orchard. They should be at least 25 feet apart, and at first no nearer to dwelling houses, except in the case of shelves for such birds as robins, phœbes, and swallows. If occupied where first set up, they can be moved a little nearer your house each year until they are close enough to be watched from your window.

The box should be at least 10 feet from the ground, unless you are sure there are no cats around that can possibly get the little birds. Ordinarily, they should be protected by a good cat-guard. A box mounted on an iron post or pipe is surely out of the reach of cats, but for a wooden support, a sheet of tin, iron, or zinc two feet wide should be nailed around it. Another good type of guard is represented at the right in Fig. 1. Any of these guards should be put not less than seven feet from the ground so that no cat can jump to the post or tree above it.

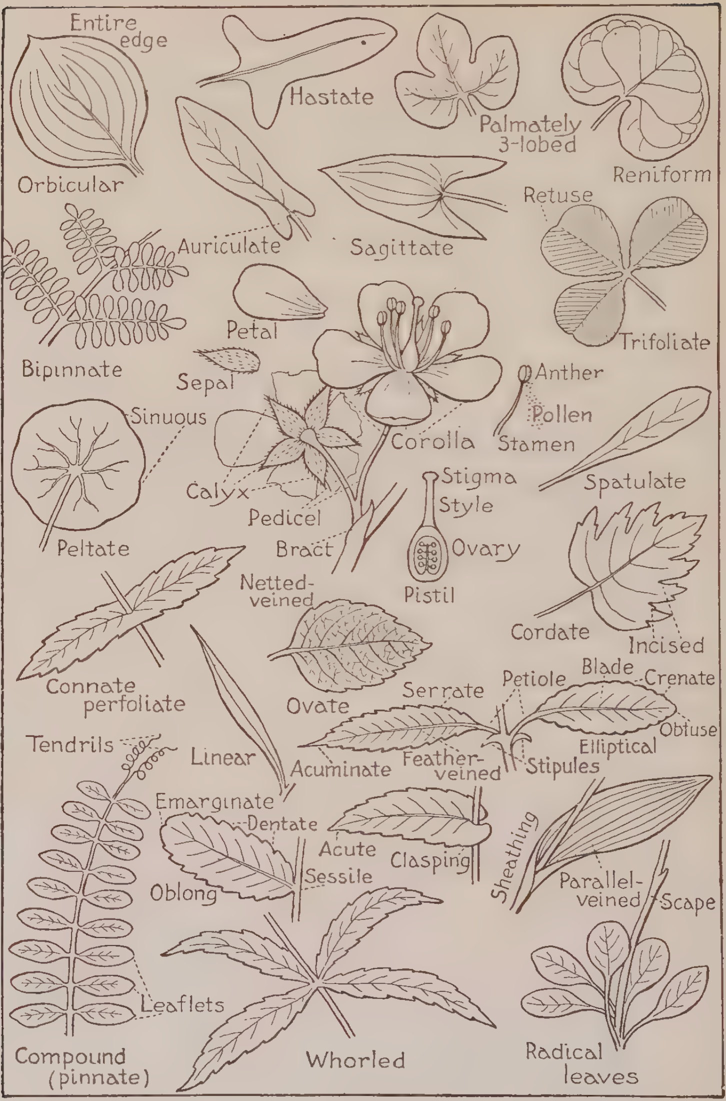
It may often be a kindness to leave nesting-boxes out all Winter so that those birds that stay with us may have them in which to sleep, but if this is done they should be opened, and thoroughly cleaned out at the very first approach of Spring. New tenants, or the old tenants returning, would not like to find old nesting-material, insect-nests, cocoons, and such things. As mentioned in telling of the building, all bird-houses should be made so they can be opened, either by taking off the roof, bottom, or a side, or having that part fastened on with a hinge. After a year or so of use there will be repairs to make which can well be done at this yearly cleaning. Many people prefer not to see these nesting-boxes in place out of season, in which case they should be taken down early in the Fall, cleaned inside and out, painted or stained, and put away for next season. They should be put out again by Washington's Birthday, and in the South a little earlier, lest some little home-builder, missing his tenement of last year, choose another site for his nest-building.

The birds will not thank you for including any straw, twine, or other nesting material in your boxes. The only exception to this is in the case of cavities intended for wood-peckers, which should have an inch or more of fine chips, coarse saw-dust, or ground cork. However, if your parents will let you litter up the place a little, it will help the birds if you put out small loose bunches of straw, bits of cloth, string, and such things in the vines or hedges. You can hide these where they will not be noticeable to human eyes, but you may be sure there are sharper ones that will discover them.

The table printed on page 554, published by the United States Agricultural Department, gives the sizes of bird-houses, the entrance doors, etc., best suited to our various birds.

Give us, O give us, the man who sings at his work! Be his occupation what it may, he is equal to any of those who follow the same pursuit in silent sullenness. He will do more in the same time—he will do it better—he will persevere longer. One is scarcely sensible to fatigue while he marches to music. The very stars are said to make harmony as they revolve in their spheres. Wondrous is the strength of cheerfulness, altogether past calculation its powers of endurance. Efforts to be permanently useful must be uniformly joyous—a spirit all sunshine—grateful for every gladness, beautiful because bright.—THOMAS CARLYLE.

KNOWING THE FLOWERS


Entire edge
Hastate
Palmately 3-lobed
Reniform
Orbicular
Auriculate
Sagittate
Retuse
Trifoliate
Bipinnate
Petal
Sepal
Anther
Pollen
Stamen
Corolla
Spatulate
Sinuous
Peltate
Calyx
Pedicel
Bract
Stigma
Style
Ovary
Pistil
Cordate
Incised
Netted-veined
Connate perfoliate
Ovate
Serrate
Petiole
Blade
Crenate
Obtuse
Elliptical
Stipules
Feather-veined
Acuminate
Linear
Tendrils
Emarginate
Dentate
Acute
Clasping
Sessile
Oblong
Sheathing
Parallel-veined
Scape
Leaflets
Compound (pinnate)
Whorled
Radical leaves

THE STORY OF PLANT LIFE

NO matter how many things there are in nature about which we can have at present no certain knowledge, of this we can be sure—that the first kinds of living things on the earth were plants. No kind of animal could have been first, for there is no kind of animal that can feed itself without the help of the plant. When life first appeared on the earth, there was nothing for it to feed upon but lifeless things, like air, and salt, and water; and the only kind of creature that can live on such things is the plant. What, then, are plants?

PLANTS ARE LIVING THINGS

That plants are living things is the first idea we must clearly form about them. They are living in just the same sense that we are. The higher plants were born from a seed, the joint product of two previous individuals, their father and mother. Plants likewise live by eating; they have mouths and stomachs, which devour, digest, and assimilate the food supplied to them. These mouths and stomachs exist in the shape of leaves, whose business it is to catch floating particles of carbon dioxide in the air around, to suck such particles in by means of countless lips, and to extract from them the carbon which is the principal food and raw material of plant life. Plants also drink, but, unlike ourselves, they have quite different mouths to eat with and to drink with. They take in their more solid constituent, carbon, with their leaves from the air; but they take in their liquid constituent, water, with their roots and rootlets from the soil beneath them. "More solid," we say, because the greater part of the wood and harder tissues of plants is made up of carbon, in combination with other less important materials; though, when the plants eat this carbon, it is not in the solid form, but in the shape of a gas, carbon dioxide. So far, it will be enough to remember that plants are living things, which require food and drink exactly as we ourselves do.

PLANTS MARRY AND REAR FAMILIES

Plants have two distinct sexes, male and female—sometimes separated on different plants, but more often united on the same stem, or even combined in the same flower. For Flowers are the reproductive parts of plants; they are there for the purpose of producing the seeds, from which new plants spring, and by means of which each kind is perpetuated. The male portions of plants of the higher types are known as stamens; they shed a yellow powder which we call pollen, and this powder has a fertilizing influence on the young seeds or ovules. The female portion of plants of the higher types is known as the pistil; it contains tiny undeveloped knobs or ovules, which can only swell out and grow into fruitful seeds provided they have been fertilized by pollen from the stamens of their own or some other flower. The ovules thus answer very closely to the eggs of animals. After they have been fertilized, the pistil begins to mature into what we call a fruit, which is sometimes a sweet and juicy berry, as in the grape or the currant, but more often a dry capsule, as in the poppy or the violet.

Plants, however, unlike animals, are usually fixed and rooted to one spot. This makes it practically impossible for them to go in search of mates, like birds or butterflies, squirrels or weasels. So they are obliged to depend upon outside agencies, not themselves, for the conveyance of pollen from one flower to another. Sometimes, in particular plants, such as the hazels and grasses, it is the wind that carries the pollen on its wings from one blossom to its neighbor; and, in this case, the stamens which shed the pollen hang out freely to the breeze, while the pistil, which is to catch it, is provided with numberless little feathery tails to receive the passing grains of fertilizing powder. But oftener still, it is insects that perform this kind office for the plant, as in the hollyhock and the greater part of our beautiful garden flowers. In such cases the plant usually has very attractive blossoms with bright-colored petals, which allure the insect, while it repays him for his trouble in carrying away the pollen by giving him in return a drop of nectar. The bee or butterfly goes there, of course, for the nectar alone, unconscious that he is aiding the plant to set its seeds. There is no more fascinating chapter in the great book of life than that which deals with these marriage relations of the flowers and insects.

How Plants Start Their Young Ones in Life

Again, after the plant has had its ovules fertilized, and has set its seed, it has to place its young ones out in the world to the greatest advantage. If it merely drops them under its own branches, they may not thrive at all; it may have impoverished the soil already of certain things which are necessary for that particular kind; and even where this is not the case, the surrounding soil may be so fully occupied by other plants that the poor little seedlings get no chance of establishing themselves. To meet such emergencies, plants have invented all sorts of clever dodges for dispersing their seeds. Thus, some of them put feathery tops to their seeds or fruits, like the thistle and the dandelion, the willow and the cotton-plant, by means of which they float lightly on the air, and are wafted by the wind to new and favorable situations. Others, again, bribe animals to disperse them, by the allurement of sweet and pulpy fruits, like the strawberry or the orange; and in all these instances, though the fruit or outer coat is edible, the actual seed itself is hard and indigestible, like the orange-pip, or is covered with a solid envelope like the cherry-stone. Numerous other examples might be given. We have to remember, then, that plants to some extent provide beforehand for their children, and in many cases set them out in life to the best possible advantage.

Most of these points to which we are here briefly calling your attention are true only of the higher plants, and especially of land plants. For we must not forget that plants, like animals, differ immensely from one another in dignity, rank, and relative development. There are higher and lower orders; grades and classes; some big, some small; some annual, some perennial; some rooted in dry land, while some float freely about in water; some with soft stems like spinach and celery, while others have hard trunks like the oak and the chestnut. We must ask ourselves what were the causes which made them differ at first from one another, and to what agencies they owe the various steps in their upward development. In short, we must not rest content with merely saying that the rose is like this and the cabbage like that; we must try to find out what gave to each of them its main distinctive features. We must "consider the lilies, how they grow," and must seek to account for their growth and their peculiarities.

Points to Keep in Mind

And now let us sum up again these central ideas. Plants are living things; they eat with their leaves, and drink with their rootlets. They take up carbon from the air, and water and other materials, except carbon, from the soil, and build the materials so derived into their own bodies. Plants also marry and are given in marriage. They have often two sexes, male and female. Each seed is thus the product of a separate father and mother. Plants are of many kinds, and we should learn how they came to be so. Plants live on sea and land, and have varieties specially fitted for almost every situation. Plants have very varied ways of securing the fertilization of their flowers, and seem to look after the future of their young, like good parents that they are, in many different manners. Plants are higher and lower, exactly like animals.

These are some of the points we must keep in mind and study further about, if we are ever to become familiar with the wonders of plant life.

How Plants Breathe

We must learn more and more of the wonderful way in which plants help to keep the world alive, and as we read we shall come to understand the great mystery of the stuff that makes the grass green. Without this we could not be alive. We know that all air contains carbonic-acid gas, which is poison to us and to all animals. But the plant has a secret which no man knows of; it can split up this gas and live on it, taking it into its own body and building up food for us to live upon. To do this the plant uses the greatest power in the world, the power of sunlight. The leaves of a plant are flat and thin, so that they can drink in as much sunlight as possible, and the power of the sun helps the green stuff to split up the carbonic-acid gas into two parts. One of these the plant eats itself, and the other it gives back to the air quite pure. If it were not for the plant's power of doing this there would be no life anywhere, and the world would be as dead as a stone.

Let us now see what we mean when we say that a plant breathes. If we can understand this for a plant, we shall understand it for every living thing, including you and me. When we talk about breathing, we usually think of the way in which our chests move up and down, as we draw the air into our lungs when we are taking a breath, and then let it out again.

Now, a plant has no chest or lungs, and many animals have neither chest nor lungs, but yet they all breathe. It is not necessary that a living thing shall move up and down, or in any other way, in order to breathe. We do so; but that is because we breathe so very quickly, and because we have learned a special way of breathing that is very easy and successful. But all breathing is really one and the same, whether it is done by a dandelion or an oak-tree, by a fish or a man.

Wherever living things are to be found, whether under the water or out of the water, there must always be a particular kind of stuff called oxygen. This is a thing we may have never seen or heard of, and yet, whenever we see anything at all, we see through oxygen—because it is part, and the most important part, of what we call air. Oxygen is found in air, and it is also found in water. If a living thing lives in air, it has to get its oxygen from the air. If it lives in water, it has to get its oxygen from the water. The first plants did this because they lived in water, like many plants of to-day, and like crabs and fishes and many other animals. But later plants, like the flowering plants, moved out of the water on to the land, just as animals have done, and so they have to get their oxygen from the air, just as cats and horses and birds and men do.

Breathing is an act that has two parts, which go on backward and forward always; and the first of these two parts is taking in oxygen. Every living thing does this, and must die if it ceases to do it. But what is the second half of this act of breathing? You may well ask. Directly we think about it we shall see that the oxygen which is taken in by breathing must go somewhere, something must happen to it, and the simple fact is that the second half of the process of breathing always consists of giving back the oxygen to the air or to the water.

But if that were all, of course there would be no sense in it; it would not be worth doing. But the point is, that while the oxygen comes in alone, "by itself," it always comes out again with something else; and it is that which makes all the difference. This something else, though you could hardly believe it, is the same stuff as that which makes coal and diamonds and the writing part of lead-pencils, and its name is carbon.

When this carbon which the oxygen has found in the body of the animal or the plant is joined to the oxygen, it is turned into a gas, but you cannot see it, however closely you look at any one when he is breathing. It mixes with the air, and though you cannot see it, you see through it, just as you see through the air itself. This new kind of stuff, like oxygen, and like the stuff which comes through pipes into houses, and is burned at the end of them, is a kind of gas, and the special name for it is carbonic-acid gas. Every living thing, from its first moment of life to its death, breathes in oxygen and breathes out this stuff which is made of carbon and oxygen, and which is called carbonic-acid gas, or carbon dioxide.

Now, plants must do this because they are living things, and they cannot live without it. It is quite easy to prove that a plant must breathe to some extent, at any rate, because you can suffocate a plant as easily and certainly as you can suffocate an animal. If you keep away all oxygen from an animal, you suffocate it, and it will die, and the same is true of a plant. If it does not have enough oxygen, and have it all the time, day and night, any living thing, from a microbe up to a man, will die of suffocation.

How Plants Do the Opposite of Breathing

Just because this is true of every living thing, we must not forget it in the case of the plant; but at the same time a plant needs far less oxygen than an animal, because it breathes much more slowly, and the curious thing, as we must now see, is that most plants are specially good at doing something which is just the opposite of breathing, something which no animal can do, and which every animal depends upon plants to do for it. The plants that do this wonderful thing that we are going to talk about are all green plants, or, at any rate, if they are not green, like grass, they are brown, like seaweed. But the little difference in color does not matter, for the seaweed contains some of the stuff that makes grass green. This stuff is so important that we must think of all plants in the world as divided into two great kinds—those which have this green stuff, and those which have not. The first kind we shall call green plants, and we must now talk about them very carefully.

Very nearly all plants are green plants, but we have already mentioned one or two that are not—such, for instance, as the mushroom. The plants that have no green stuff in them are peculiar, so to speak. We must think of them as if they did not do what a plant ought to do; they have lost what is the most striking and important power of plants, and so for the present we can leave them out of account.

The green stuff of all other plants is really one and the same everywhere. It is the same stuff in a cabbage, a blade of grass, a leaf of a tree, or the scum of plants that forms on a still pool of water. It has a long special name—chlorophyl—but here we need not bother ourselves with that; we may just call it green stuff, or leaf-green.

WHAT THE GREEN STUFF DOES AND WHAT THE SUN DOES

This green stuff is most important because of what it enables the plant to do, and that is what we must now talk about. But we must begin at the beginning—and that beginning is not the green stuff itself, but the sun, the great and glorious sun. By itself the green stuff can do nothing; it is of no use to the plant, and is only a burden to it. Indeed, if plants are cut off from sunlight altogether, they die at once, or, at any rate, lose all the green stuff in them. It is the sun that makes the green stuff in the plant, and green stuff's only use, after it is made, is to help the plant to profit by the sun.

Now, this is just a tremendous fact, and we should make a very great mistake if we went on to talk about what the green stuff does without making quite sure that we understood what the sun does. Without the sun there would be no life at all upon the earth. Just as all living things depend upon each other, and just as they could not exist unless they were always serving each other, as we saw a little while ago, so the whole company of living things depends upon the sun.

Company is a very good word, because its real meaning, as you will learn again some day, is "the people who feed together." *Com* means with, or together, and *pany* really means bread. Your *companion* is really the little boy who *eats bread with you*. Now, all living things do their feeding with each other, with each other's help, and so we are very right in calling them a company; but without the sun none of them could feed at all, and they would all die. Indeed, it is really the light and power of the sun that we all feed upon, and the wonderful thing about the green stuff of the green plant is that, without the green stuff, we could not use the sunlight. First of all, the sun makes the green stuff in the green plant, and then uses it to feed the green plant and all other living things, including you and me, for we get all our food either from the green plants or else from the bodies of animals that live on green plants.

Without the sun there would be no life upon the earth; or, to put it very shortly and plainly, in a way that you ought to remember, *No light, no life.* We think it has never been put much more shortly than that, and yet, short as that is—no light, no life—it is absolutely true, and there are no exceptions to it anywhere, and never have been, and never will be.

If the Sun Were to Go Out Everything in the World Would Die

The green stuff, then, though no life can do without it, is only an instrument, something the light uses to make life. If the sun were to go out—though there is no fear of that—all the green stuff in the world would not help us at all, and all the plants and animals would soon die. There was some excuse, you see, for the ignorant and untaught men of long ago who used to worship the sun. When we go out on a bright day and enjoy the light and warmth of the sun, we must remember that if it were not for this light and warmth we should not be here. This is true of us; it is true even of animals that live in the dark; it is true even of trees and fishes, and seaweed and microbes. Some of these creatures, like microbes, may be killed by sunlight, and they have to keep out of its way; so may we be killed by sunlight if it is too strong, and gives us sunstroke. But even microbes depend upon the sun for their life, for without the sun none of the things upon which microbes feed could possibly exist.

Now that we have learned how important the sun is, we are ready to look at the green stuff of the green plant with a new interest, since it is the means by which light can produce life.

The Reason a Leaf Is Flat and Thin

The tiny specks of green stuff which give the leaf its color are of the same green stuff that is to be found in other parts of plants besides the leaves. We know that the stem, or stalk, of a rose is green. But most of the green stuff of plants is found in their leaves, and it is for the sake of the green stuff that leaves exist at all. The leaves of a plant are its tools for using the green stuff. Directly we think of a leaf we see that it is made in a particular way. It is a flat, thin thing. So much are leaves flat, thin things that we call other things which are flat and thin "leaves," though they are not parts of a plant at all—the leaves of this book, for instance.

Now, there is a very good reason why leaves should be flat and thin.

Leaves exist in order to expose as much green stuff as possible to the light. If a leaf were shaped like a ball, only the green stuff on the outside of it, and, indeed, only the green stuff on the side of it which was turned to the sun, could receive the sunlight. All the rest would be in darkness, and that is as good as to say that it would be quite useless. If you like, you may try to think of some kind of leaf that would expose its green matter to the sun in a better way than the leaves you know. But you will not succeed. Perhaps you never asked yourself before why a leaf is shaped like a leaf; but the question is worth asking, and the answer is that no other shape can be even thought of that would be so useful.

What the Sunlight Does With the Green Stuff

The object of a leaf is to expose as much green stuff as possible to as much sunlight as possible, and it does this perfectly. Of course, a leaf must have two sides, and if one side is exposed to the sun, the other must be in the shade. But, then, leaves are usually so very thin that the sunlight can go right through, and so none of the green stuff is wasted.

Sometimes, when leaves have to be rather thicker, you will find that as little green stuff as possible is wasted, for now almost all the green stuff is packed on to the upper side of the leaf, which is dark green; and if you turn it over you will find that the under side is hardly green at all. Green stuff is of no use where it cannot get the sunlight. But you see how well things fit in with each other, for the green stuff is made by the sunlight in the first place; it is made where the sunlight strikes the leaf, and is made just where it can be useful.

And now we come to something rather more difficult; but it is not too difficult for us, and it is very important, for it is necessary to all life. We have agreed that there is something which the green stuff does by means of the sunlight, or, better still, there is something which the sunlight does by means of the green stuff. Now, what is it?

How Plants Eat

We should know all we can of the way in which a plant lives upon air. None of us could live without air, but all that we do is to breathe air. The great secret of the plant is that it can eat air and live upon it. The green stuff in the plant is made by the sunlight, as we have seen; it is made where the sunlight strikes the leaf; and when it is made the green stuff uses the sunlight to do a remarkable thing. It takes the carbonic-acid gas that is in the air and splits it up into two things—carbon and oxygen. The carbonic-acid gas is poison, but the plant splits it up and makes it into food, not only for itself, but for us. That is what a plant does with the sunlight.

If we go back to what we said about the plant's breathing, we shall remember that the plant is surrounded by air. We have seen that this air contains oxygen, which is a gas, but it also contains other gases, for the air we breathe is nothing else than a mixture of gases. Now plants, as well as animals, breathe air, but all green plants do also what no animal can do—they eat air. The gas in the air which plants eat, or feed upon, is, curiously enough, the same gas as that which the plant gives out while breathing—carbonic-acid gas. We have already seen that this carbonic-acid gas is made up of two parts—carbon and oxygen. Carbon is important not merely because it makes diamonds and coal and lead-pencils, but because it is one of the things that are always necessary as part of the food of living creatures, animal or vegetable.

All air contains a small quantity of carbonic-acid gas, which is partly made up of carbon. So far as animals are concerned, this gas is a poison. If there is any more than only a very little in the air, we die, so far are we from being able to make any kind of use of it. One of the dificulties of our life in houses is to keep the air fresh—that is to say, to prevent it from having too much carbonic-acid gas in it.

But this stuff, which is poison for us and for all animals, is food for the plant; and, if it were not food for the plant, there would be no risk of it poisoning animals, for there would be no animals for it to poison. That is the way in which living things depend upon each other. Now, the great question is: How does the plant manage to make food for itself out of this carbonic-acid gas? The gas itself is of no use to the plant, any more than it is to us. We have already seen that the plant gets rid of it when it breathes, just as we do, and to take it back again as it is would doubtless kill the plant, just as we should be killed if we went on breathing our own breath—or other people's—over and over again.

The only way in which the plant can get food out of the carbonic-acid gas is to split it up into the two things of which it is made—carbon and oxygen, to keep the carbon, which is good food, and to give back the oxygen to the air. This, you see, is exactly the opposite of what the plant does when it is breathing. Now, the plant only does this in daylight, because it depends upon the sun for its power to do it; but though it only does this in daylight, while it breathes all the time, day and night, yet it breathes so slowly and it does this so quickly, when it does do it, that in the long run it takes from the air far more carbon than it gives to the air, and builds up this carbon into its own body. That is why it grows and how it grows; and a plant goes on growing all its life, while boys, as we all know, go on growing for only a few years, and then never grow any more.

That is really one of the greatest differences in the world between animals and plants, and it entirely depends upon this great power that the plant has of taking carbonic-acid gas from the air, splitting it up into its carbon and oxygen, giving back the oxygen to the air, and building up the carbon into its own body. Every green plant does this all its life for so much of every twenty-four hours as there is sufficient light in the sky. As it is building the carbon up into its own body, it fixes the carbon on to other kinds of stuff in such a way as to make things which animals, including ourselves, can eat.

THE MOST IMPORTANT THING WE KNOW ABOUT PLANTS

All animals, like all plants, require carbon, but if we were left with nothing but the carbon dioxide in air to get our carbon from, in a coal-mine, with tons of carbon all around us, and tons of lead-pencils and millions of dollars' worth of diamonds, we should die of starvation in a day or two. There would be enough carbon around us to keep I do not know how many thousands of animals alive, if only it could be used. But we should be like the foolish king in the story who wished everything turned into gold, and then found that though everything was gold and worth a great deal, it was worth nothing to him, for you cannot live by eating and drinking gold. Just in the same way animals—which must have carbon or die—cannot live on diamonds or even on the carbonic-acid gas in the air, and the most important fact about green plants is that they can take the carbon from the carbonic-acid gas in the air, can live on it, and turn it into their own bodies, and then gives those bodies as the food without which the whole animal world, including even ourselves, must surely die.

THE WONDERFUL WORK THAT THE GREEN STUFF DOES

What about the green stuff again? What does it do? Well, the answer is that without it none of this could be done. Let us see what it is exactly that happens. Carbonic-acid gas, as we have seen, is made up of carbon and oxygen, and these two things are joined very powerfully together. Unless you are a green plant, it is one of the most difficult things in the world to separate the carbon and oxygen of carbonic-acid gas from each other. They are so powerfully joined that it needs very great power, used in just the right way and at just the right moment, to separate them, and then, if you are not very careful and clever, they will join together again before you know where you are. All this is supposing that you are not a green plant. It is only quite lately that men have learned, with great difficulty and expense, and long preparation and a great deal of danger, to separate carbon and oxygen from each other when once they have joined to form carbonic-acid gas. But if you are a green leaf it is quite different.

The green stuff in the green leaf has no power of itself, and you understand that it is power which is wanted in order to separate things which are powerfully joined together. The more tightly a nail is driven into a wall the harder you must pull to get it out.

How the Plant Uses the Strongest Power in the World

Now, there is no power in the world stronger than the power of sunlight. The plant knows this, and men know it, too. So, when they try to separate carbon from oxygen, men naturally use the power of sunlight in order to overcome the power with which the carbon and oxygen are holding on to each other; and, of course, men can help themselves to sunlight just as well as the leaf can—and much better. They can store it up and turn it into other shapes, and then let it loose, so to speak, in far greater power than the leaf ever has any chance of using—that is to say, men can use far more sunlight at a given moment than the leaf ever gets a chance of using at a given moment. Between two ticks of a watch the leaf only gets a certain small amount of sunlight, even on the brightest day in summer in the hottest part of the world, where the sun is shining straight down upon it. Now, men can store up sunlight in hundreds of different ways, so that between two ticks of a watch they can use, if they like, millions of times more than the leaf would receive in the whole of its lifetime.

The Difference Between Having Power and Using Power Properly

But it is not enough to have plenty of power—you must know how to use it, or how to apply it, or how to direct it. If the power in a steam-engine is properly used, it will draw a train or take a great boat across the ocean; but if it is not properly applied or directed, it will go its own way and may kill thousands of people. This difference between having power and using it properly is true of everything—green leaves and steam-engines and everything else—and a whole library of books might be written on just this one little truth. It is really one of the greatest truths in the whole world.

Money is power, and great things may be done with it. With enough money a man might save millions of lives every year; but we all know that it is not enough to have money in order to profit by it. You must know how to use it, how to apply it, how to direct it. Many people nowadays have plenty of money, and all they do with it is to destroy themselves and destroy or make miserable thousands of other people. Then, again, to be clever is power; but that power is worth nothing unless it is properly used, applied, or directed. One of the cleverest men who ever lived was called Napoleon. His cleverness was so powerful that if it had been properly applied it might have made the world into a better and happier place for all ages to come; but he did not know how to use his cleverness or power, and so he caused the death of at least eight million men, women, and children, destroyed the happiness of countless millions more, and died wretched and in prison. That is the difference between having power and knowing how to use it.

Now let us go back to the green leaf we were talking about. The sunlight which pours down upon it is power. Clever men, all gathered together, after making long preparations, can help themselves to far more power than the green leaf can get, but they cannot apply it, and so they can scarcely do what the green leaf does. The green stuff in the green leaf makes it able to apply all the sunlight it gets to the business in hand, which is to split up the carbonic-acid gas of the air into its carbon and oxygen, and to keep the carbon for the use of the plant. This is done without any machinery, without great heat, without any waste at all, and without any wear and tear of anything.

In the whole wonderful world we know of nothing to beat this for the perfect way in which power is put to use. It is not merely the best, it is perfect, and without it this glorious earth, with all its wonders of life—trees and fish and birds and men—would be as dead as a pebble. So if you are a boy you might do worse, when next you run out into the garden, than take off your hat to the sun above you and the grass upon which you tread.

Though you are, beyond words, more wonderful and greater than either of them, and though they are so wonderful themselves just because they make boys possible, yet who will dare to deny that even boys owe them wonder and awe and love?

How We Learned About Plant Foods in the Air

It is still a common belief that the great bulk of all plants comes from the soil, and this belief is considerably strengthened when first-class gardeners constantly recommend trenching or deep digging, as well as manuring. When one sees the oaks, beeches, elms, pines, etc., of our country, the giant trees of California, and those of Australia—gum-trees—many of them over 300 feet high, one can hardly imagine the great bulk of these trees to have been derived from the small quantity of carbon floating about in the air we breathe. Such, however, is the case. The great mass of tissue in a plant is secured, not from the soil, but from the atmosphere.

The old philosophers, including Aristotle, taught that all the nourishment of plants came from the soil alone. This doctrine was accepted without question for centuries. At last a learned Belgian physician, named Jan Baptista van Helmont, who was born in Brussels in 1577, entertained doubts as to the accuracy of this teaching. To settle the matter he commenced experimenting. He planted a willow, which he had previously carefully weighed, in a pot containing 200 pounds of soil. He watered the plant daily with rain-water. The willow flourished, and at the end of about five years' cultivation he weighed the plant and soil again. The willow had gained 164 pounds in weight, but the soil had only lost two ounces! It was therefore obvious that Aristotle and the others had been wrong. It was impossible for the 164 pounds of wood, leaves, etc., to be made out of the two ounces of soil.

Helmont was puzzled, and eventually came to the erroneous conclusion that the extra weight could only be obtained from the water he had given the plant. He had no idea of the numerous minute pores or stomata on the under surface of the leaves, nor of the fact that carbonic-acid gas was absorbed from the atmosphere during the daytime, and oxygen liberated. This discovery was made 200 years later by a Dutch scientist, Jan van Ingenhousz, who published his researches in 1779.

How Plants Drink

We know, then, that plants, for the most part, eat with their leaves, and that they grow, on the whole, out of the air, not, as most people seem to fancy, out of the soil. Yet you must have noticed that farmers and gardeners think a great deal about the ground in which they plant things, and very little, apparently, about the air around them. What is the reason for this curious neglect of the real food of plants, and this curious importance attached to the mold or soil they root in?

That is the question we shall have to consider now; and we shall answer it in part at once by saying beforehand that, though plants do grow for the most part out of the carbonic acid supplied by the air to the leaves, they also require certain things from the soil, less important in bulk, but extremely necessary for their growth and development. What they eat through their leaves is far the greatest in amount; but what they drink through their roots is nevertheless indispensable for the production of that living green stuff, which is the original manufacturer and prime maker of all the material of life, either vegetable or animal.

Plants have roots. These roots perform for them two or three separate functions. They fix the plant firmly in the soil; they suck up the water which circulates in the sap; and they also gather in solution certain other materials which are necessary parts of the plant's living matter.

The first and most obvious function of the root is to fix the plant firmly in the soil it grows in. Very early floating plants, of course, have no roots at all; they take in water and the dissolved materials it contains, with every part of their surface equally, just as they take in carbonic acid with every part of their surface equally. They are all root, all leaf, all flower, all fruit. But higher plants tend to produce different organs, which have become specially adapted by natural selection for special purposes. If you sow a pea or bean you will find at once that the young seedling begins from the very first to distinguish carefully between two main parts of its body. In one direction, it pushes downward, forming a tiny root, which insinuates itself with care among the stones and soil; in the other direction, it pushes upward, forming a baby stem, which gradually clothes itself with leaves and flowers.

The tip of the root is the part of the plant which has the greatest aptitude—so much so that Darwin likened it to the brain of animals. For it goes feeling its way underground, touching here, recoiling there, insinuating little fingers among pebbles and crannies, and trying its best by endless offshoots to fix the plant with perfect security. Large trees, in particular, need very firm roots, to moor them in their places, and withstand the force of the winds to which they are often subject. After every great storm, as we know, big oaks and pines may be seen uprooted by the power of this invisible but very dangerous enemy.

The root, however, does not serve merely to anchor the plant to one spot, and secure it a place in which to grow and feed; it also drinks water. The hairs and tips of the roots absorb moisture from the soil; and this water circulates freely as sap through the entire plant, dissolving and carrying with it the starches and other materials which each part requires for its growth and nourishment. Without water, as we all know, plants will wither and die; and the roots push downward and outward in every direction in search of this necessity of life for the leaves and flowers.

Plants, then, drink by means of roots. But they take up by them not only water, which is their needful solvent, but also other materials urgently required for their growth and development. The most important of these materials is certainly nitrogen, which forms a most needful part of protoplasm, the living matter that scientists call the "physical basis of life," the thing without which no plants or animals could be possible. Nitrogen is also necessary to the making of leaf-green. Where, however, the roots do not supply nitrogen in sufficient quantities, plants procure it for themselves by means of their leaves or stems, and therefore become insect-eating or flesh-eating.

Roots, however, have other functions besides drinking water and sucking up with it certain dissolved materials; the chief of these other functions are fixing the plant securely in the ground, and affording a safe place of winter storage for starches and other surplus foodstuffs.

Wonders of a Green Leaf

With the advent of spring the sap begins to rise, the buds to swell and the leaves to unfold. This annually recurring condition of things we accept as such an ordinary and commonplace occurrence that it attracts no notice. One would as soon think of giving heed to the fact that plants have leaves as to specially notice that animals are covered with hair, birds with feathers, and that fishes have scales. Nevertheless, a close look at a green leaf and a careful study of its structure and functions will afford us many happy and instructive moments.

Few of us ever think of a green leaf as a breathing, living organism, but, in some respects, such is a fact. Of course, leaves do not breathe muscularly as animals do, but the diffusion of the air through their structure in a way suggests animal breathing. In the surfaces of leaves there are many tiny holes with well-balanced valves that are extremely sensitive to external conditions. These are the breathing pores of the plants and are called stomata. These stomata belong especially to the green parts of plants but have been found on all parts except the roots. They have the power to open or close, as acted upon by the proper influence. In the light they remain wide open, but darkness causes them to close. The application of water will usually cause them to close, but in certain orchids and lilies, strangely enough, quite the opposite effect is the case. These, however, seem to be not the rule but quite exceptional cases.

Respiration, or breathing, is exactly the same process in plants as it is in animals. When an animal breathes, oxygen is retained and a gas called carbon dioxide is thrown off. In like manner, when a plant breathes, oxygen is taken in and carbon dioxide is given off.

Respiration, or breathing, is going on continuously in living plants, both day and night. But in the daytime it is somewhat masked or hidden by an entirely different process which takes place only in the presence of light; that is, by the capacity of green plants to make certain substances called carbohydrates out of carbon dioxide and water, by the aid of light. This unique process is known as *photosynthesis.* It will be clear that it covers up the results of breathing when we remember that in photosynthesis carbon dioxide is taken in and oxygen is given off, and this is exactly opposite to the results of breathing.

If you can examine a thin section of a leaf through a microscope, you will see that it is composed of a number of cells of various shapes and sizes. Usually, the cells along the lower side are more scattered and have air-spaces among them. With the exception of the outside layer of cells, forming the "skin" of the leaf, these tiny cells contain minute granules of a green-tinted substance, called chlorophyl. It is this substance that gives the green color to the leaf. When air comes through the stomata and circulates among these cells, the carbon dioxide that it contains is decomposed by this chlorophyl. The oxygen is returned to the air but the carbon is retained and with the water is sent to various parts to form wood, fruit, nuts, berries, etc.

WILD FLOWERS

By C. A. DARLING and R. W. SHUFELDT

With changes by the Editors

AS you walk about in the fields and in the gardens and look for different kinds of plants you will wonder how one person can ever learn to know all of the different ones, for you should remember that in other States and in other countries there are just as many more, and many times they are very much different from those which you see so often. There are many, many thousands of different kinds of plants, and it would not be easy to find out a new plant unless many of the ones that we see were very much alike.

When we find a flower in the woods or in the fields and want to know its name, how can we pick it out of a list of so many thousands? It is not easy at first, but many persons, called botanists, have worked hard studying every kind of flower, and they have made it much easier for us. They have found out that many plants which are not alike in size, in the shape of the leaves, or in the color of the flowers, are alike in the number, in the shape, and in the arrangement of the different parts of the flower. These plants which are somewhat alike they place in a group and call it a *Family*, and in this way they are able to arrange all these thousands of plants into small groups. Instead of reading about thousands of different plants to find the one which we have picked, we have only to find to which family it belongs and then to look in that family for the one which is most like the plant that we have found.

In the study of animals we can see how much alike are the dog, the wolf, and the fox; these animals all belong to the same family; and when we see a tiger or a lion we know that it must be related to the cat, for they resemble each other in some ways. So it is when we begin to study plants or animals: we must learn to know what are the characters that place a plant or an animal in a certain family; this makes our study much more simple.

I will tell you how you may learn to know four of the common families, for you will see some plants that belong to these families nearly every time that you look for new flowers. You should try to pick up as many different plants as you can which belong to the same family; they will be different from each other in some ways, and so you must look for the differences after you have seen how much alike they are.

Rose Family

If you take a flower of the wild rose and examine it closely, you will find that there are five broad petals; inside these five petals is a ring of very many stamens, these stamens often close against the petals. Inside these stamens and in the center of the flower you will see the tops of several seed-vessels. Underneath the petals you will find five green-pointed sepals which are joined together at the bottom and form a green tube. You will notice that I have said nothing about the color of the flower nor about its size.

If you should look at a flower of a strawberry or of a cinquefoil, you would find that all I have said about the wild rose could be said about these flowers. The flowers of the agrimony, the silverweed, and the saxifrage are just about the same, only sometimes different in color or in size. All of these plants I have mentioned belong to the Rose Family, and that which I have told you about the wild rose may be said about nearly all flowers in this family. So when you find a flower with just these characters you may be sure that it belongs to the Rose Family.

MUSTARD FAMILY

You can always tell a plant that belongs to the Mustard Family, for the flower is different from nearly all others. Each flower has four petals; each petal is much narrower toward the bottom, but you will see only the broader flat part which is at the upper end. There are always four green sepals which stand close against the lower part of the four petals. As you pull apart the petals you will find six small stamens, and as you examine these stamens you will find that two of them are shorter than the other four. In the center of the flower is a single green seed-vessel. Whenever you find a flower with the parts as I have told you, you may be sure it belongs to the Mustard Family. The wild mustard, shepherd's purse, pepper-root, rock cress, sweet alyssum, and many others belong to this family.

PINK FAMILY

The name which is given to a family is usually taken from that of a typical plant of the family, so if you will remember the flower of the wild pink and not think about its size or color, you will know that all flowers which have the parts like the wild pink belong to this family. There are five petals which are broader at the top; the calyx is a tube with five teeth in the wild pink, but in some flowers of this family there are five sepals which are not joined together in a tube. Each flower has ten stamens, and in the center a single seed-vessel which has from two to five threads at the top. The leaves in the plants of this family are in pairs opposite each other on the stem, they have smooth edges and are without stalks. The stem is often a little larger where the leaves join it. The bouncing bet, corn cockle, Chinese pink, and chickweeds belong to the Pink Family.

Composite Family

This family is the largest family of flowering plants that is known in the world. There are several thousand different flowers which are placed together and are called composites. This family is sometimes called the Thistle Family because there is no flower which is called Composite.

This is a very easy family for you to learn. There are very, very many tiny flowers in a head just as you have seen in the daisy and in the dandelion. Outside of these flowers are very many small, narrow green leaves which form a cup in which the flowers are placed. In some plants all of the flowers in a head have narrow, strap-shaped corollas as in the dandelion; in other plants as in the daisy, only the outer flowers have strap-shaped corollas. The flowers inside this outer ring are small tubes with five small teeth around the edge. The stamens are very small and you may not see them until you are told about them. You will see a tiny yellow stalk in the center of each tube; this yellow stalk is made up of five yellow stamens united together. To see the seed-vessel you must pick a tiny flower out of the head, and then you will find it below the corolla and outside of it. The mayweed, sunflower, golden glow, aster, fleabane, goldenrod, hawkweed, thistle, and chrysanthemum are a few of the plants which you will know belong to this great family of the Composites or Thistles.

Names of Flowers

When we make a new acquaintance we wish to know its name, whether it be a human being, a mineral, a rock, a bird, or a plant. And nearly everything in the world that has attracted attention has been given a name. But it happens that the common or popular names of objects of nature are not the same in all places where these objects are found. For example, in some parts of the country the Yellow Dog-tooth Violet is called Yellow Adder's-tongue. Again, the same common name is frequently applied to two or more flowers, as in the case of Ox-eye Daisy, which has been applied to a white flower and to a yellow one.

So, in order to avoid this confusion botanists have adopted a system of Latin scientific names, which were intended to be the same in all places and in all languages. In the descriptions of flowers, which follow, the scientific name has been printed in *italic* letters just beneath the common or popular name.

Unfortunately, in the scientific names of flowers there is lack of uniformity, because the botanists have not all agreed to the same set of rules. One group of botanists follow the code of nomenclature recommended by the American Commission in 1907. These are the names used in Britton and Brown's "Illustrated Flora of the Northern States and Canada" (2d ed.), and they have been given preference in the descriptions in this volume. Another group of botanists follow the rulings of the International Botanical Congress, held at Vienna, in 1905. These are the names used in Gray's "New Manual of Botany" (7th ed.).

In the great majority of cases the names are the same under both rulings, but when they differ both are given in this volume, the American Commission name being put first and the Vienna Congress name second, e. g.:

GROUND IVY

Glecoma hederacea Linnæus = *Nepeta hederacea* (Linnæus) Trevisan

The line drawings of flowers in the following pages were made by Everett Dewart.

YELLOW FLOWERS

MEADOW BUTTERCUP

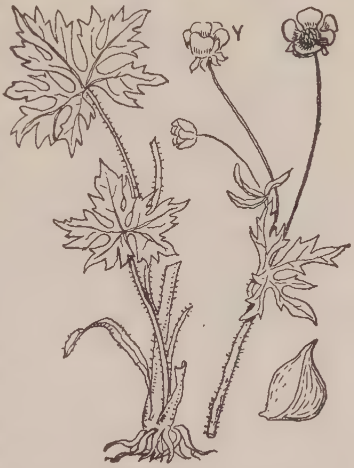
Ranunculus acris Linnæus

THE Meadow Buttercup is abundant in most parts of our country. It grows in meadows and pastures, and almost any place where it can get enough water. It blooms in the spring and early summer, and sometimes the bright yellow flowers make the fields look like a great golden sea. Each plant has several flowers.

Each flower has five glossy yellow petals which open out almost flat. Beneath these petals is the hairy calyx, which is made up of five small, pale-green, spreading sepals. The sepals remain close against the petals and do not fold back as do those of the Bulbous Buttercup.

In the center of the flower is a hard green knot of seed-vessels, with a ring of many yellow stamens all around it. When the petals and stamens wither and fall off, the knot of seed-vessels grows larger until it looks like a small green raspberry.

The leaves of the Meadow Buttercup are dark green and are covered with soft hairs. Each leaf is divided into three, five, or seven parts, and these parts are deeply cut up around the edges. The leaves have short stalks which clasp the stem where they are attached to it. The stem of the plant is round and hollow, and is usually slightly hairy. The plant grows from one to two feet high.



MEADOW BUTTERCUP (1/3 nat. size)
Y = bright yellow

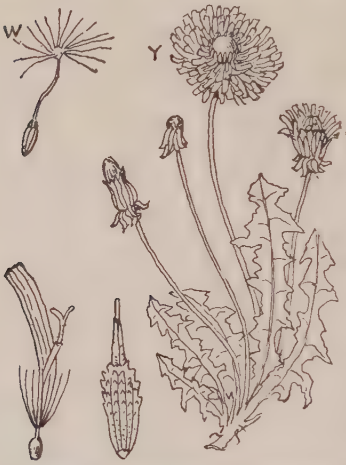
COMMON DANDELION

Leontodon Taraxacum Linnæus = *Taraxacum officinale* Weber

THE Dandelion is one of the first wild flowers that you will find in the spring, and one of the last that you will see in the autumn. It blooms almost every month in the year, and often appears in sunny places even when there is snow on the ground. In the spring and summer it sometimes covers the lawns and fields so that they look like a sheet of gold.

The large yellow flower-heads are made up of many separate little flower-tubes, each of which widens out at the mouth into a long narrow strap. The yellow tubes are placed on a round disk with the straps standing out in circles, like a rosette. The flowers around the edge of the head unfold first.

Each flower-head grows singly at the end of a long, green stalk. The stalks are hollow, and when they are broken a white, milky juice oozes out. Just below the flower-head is a green cup made up of narrow, pointed leaves. Some of these leaves curve backward toward the stalk. At night, or in rainy weather, the leaves of the green cup fold over and cover the yellow flowers.



COMMON DANDELION (2/5 nat. size)
W = white; Y = bright yellow

When the flowers have withered, the round disk is covered with tiny seeds—each seed in a slender stalk which has a beautiful tuft of short white hairs at its tip. This ball of hairy down is one of the most beautiful things in the flower-world. If you blow upon it the seeds will be carried far away by the wind.

The leaves of the Dandelion are smooth and green, and form a rosette close to the ground. The edges are cut into large teeth which are said to resemble the teeth of a lion. This is how the plant gets its name.

GOLDENROD

Solidago sp.

THE pretty Goldenrod grows nearly everywhere, and in the late summer and autumn its flowers often make the fields and pastures yellow. It is a member of that large group of plants which we call the Composite Family.

Each Goldenrod plant has many, many heads of yellow flowers arranged in clusters at the top of the branching stem. There are about ten flowers in each head, and each flower has a tiny yellow corolla-tube. At the top of this yellow tube are five small spreading teeth. In the center of the tube is a little yellow stalk, which is really a cluster of stamens joined close together. If you pull the flower-head to pieces, you will find at the bottom of each yellow tube a ring of short white hairs, and below the ring of hairs the green seed-vessel.

Surrounding each head of flowers is a large number of very small, green, pointed leaves. Their edges overlap and they form a cup in which the flower-head is placed. Each head has a short stalk, and there is often a leaf where this stalk joins the stem.

There are many different kinds of Goldenrod and they have leaves of different shapes. Some have narrow leaves without stalks. The leaves of others are ovate in shape and have slender stalks. The edges of the leaves usually have sharp teeth. If you rub the upper side of a leaf you will often find it very rough. The stems of the Goldenrod are sometimes rough and hairy and have tiny furrows running up from the base. One kind of Goldenrod that grows in the woods has white flowers, and is sometimes called Silver-rod, but all of the others have the flowers yellow.

GOLDENROD (1/3 nat. size)
Y = golden yellow

Common Cinquefoil or Five-finger

Potentilla canadensis Linnæus

This pretty plant is common almost everywhere. You will find it all summer in the meadows and pastures and along fences. It creeps over the ground and often forms thick, tangled mats.

The flowers are bright golden yellow. Each one has five rounded petals which open out like those of a rose. In the center is a thick ring of yellow stamens with slender stalks, and among these stamens is a knot of green seed-vessels. Between each two of the yellow petals can be seen a narrow green point, and if you turn the flower over you will find that the calyx is really a star, made up of ten green, pointed sepals and bractlets, five of each.

The flowers grow on long, slender stalks, which come from the places where leaves are attached to the stem. Both flowers and leaves come from what looks like another slender stalk creeping close to the ground. This creeping stalk comes from a root which goes straight down into the ground to get water for the plant. Wherever a bunch of leaves and flowers rises from the creeper, two or three little white roots go down into the ground, as in the strawberry; and these take firm hold of the earth and help to keep the plant steady. The Creeping Cinquefoil shows beautiful leaves. Each is divided into five fingers, which are cut around the edges like the teeth of a saw. The leaves are dark green, and when young are covered with fine hairs. The plant is sometimes called Fivefinger.

COMMON CINQUEFOIL (1/3 nat. size)
Y = bright golden yellow

Marsh Marigold

Caltha palustris Linnæus

The Marsh Marigold, as the name tells you, grows very abundantly by the side of ponds and in wet, marshy places. It is one of the first wild flowers that you will find in the spring. The flower is an own cousin to the Buttercup and looks much like it but is larger. There are usually several flowers near together, and each one has a short stalk.

The five bright yellow petal-like sepals are very smooth and glossy, and have tiny greenish veins running up from their bases. These veins can be seen more distinctly on the backs of the sepals than on the inner surface. The flower has no petals, and in this way is different from the Buttercup.

Inside the sepals are many yellow stamens, some of which have longer stalks than others, but when the flower becomes older the stalks are of the same length. In the center of

MARSH MARIGOLD (1/3 nat. size)
Y = bright yellow

the stamens is a group of green seed-vessels which become long and spread apart after the petals and stamens have fallen off.

The leaves of the Marsh Marigold are dark green above but their under surfaces are much lighter. They are smooth and glossy and each leaf is covered with a fine network of veins. They are nearly round in shape and have crinkled edges. Sometimes they are cooked and used for food.

The stalks are thick and hollow, with ridges along the sides. They are quite stiff and break off easily, but unless they are kept in water they soon become soft and flabby.

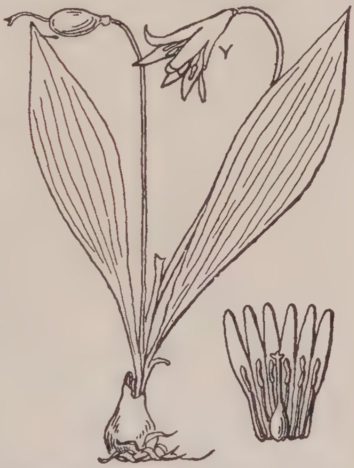
Yellow Dog-tooth Violet

Erythronium americanum Ker

This is one of the spring flowers that most children know. It often grows in great masses in the woods around trees and in wet places. It is not at all like a common violet but more like a lily, and so sometimes it is called the Fawn Lily, or Trout Lily.

You can easily learn to know the Dog-tooth Violet by its very curious leaves. Each leaf is dark green in color, and has many brown spots scattered over its upper side. The leaves are thick and have smooth edges. They are pointed at each end and their stalks seem to run down into the ground. You will find two leaves on each plant that bears flowers, but only one leaf on the plants that have no flowers.

The yellow flowers are borne singly at the top of the graceful stalk and are nodding like the Canada Lilies. The flower has six narrow parts (three sepals and three petals, which look alike), and the tip of each part is curved outward so that the flower is bell-shaped. The parts are closely fitted together where they are attached to the stalk. They have several small dots scattered over their inner surfaces.



YELLOW DOG–TOOTH VIOLET
(4/9 nat. size)
Y = yellow

There are six stamens, one standing opposite each petal. The stamen-heads are dark brown and they hang loosely upon their stalks. Down in the center of the flower is the green seed-vessel. After stamens have fallen off, this seed-vessel grows and stands nearly straight up.

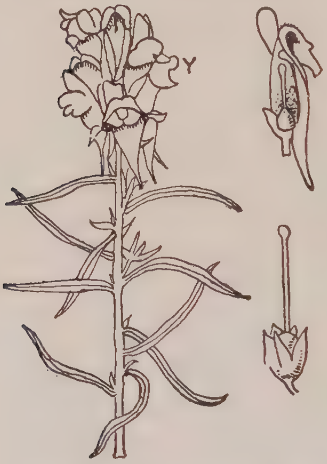
If you wish to find the root of the plant you must dig deep down into the ground. There you will find a small egg-shaped root with several white threads hanging from it.

Butter-and-Eggs

Linaria Linaria (Linnæus) Karsten = *Linaria vulgaris* Hill

The Butter-and-eggs is very common in the eastern half of the country, and grows along roadsides and in waste places. Although it has become a weed it is a pretty plant, and the flowers are very interesting. The flowers grow in a cluster at the top of a leafy stalk which is from one to two feet high.

Each flower is very odd, for there seems to be no opening into the corolla-tube. The corolla-tube is yellow and has a long spur at the base, extending below the place where the tube is attached to the flower-stalk. There are two lips at the mouth of the tube. The upper one spreads backward and has a notch at the tip. The lower one is broad and flat, with three lobes, and it is folded downward. Upon this lower lip is a tuft of orange-colored hairs.



BUTTER-AND EGGS (4/9 nat. size)
Y = light yellow

If you gently pull the lips of the corolla apart you may see down in the tube four yellow stamens. Two of these stamens have longer stalks than the other two. If you split the tube down on one side you will see the green seed-vessel in the center of the flower. Outside the corolla-tube are five green, pointed sepals with their bases joined together.

The leaves of the plant are long and narrow and have smooth edges There are many leaves scattered on the stem as well as at the base of the plant.

COMMON MULLEIN

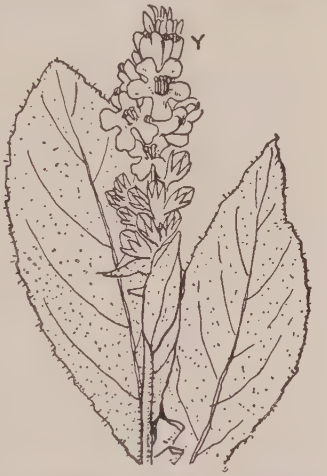
Verbascum Thapsus Linnæus

YOU can easily learn to know this plant whether it has flowers upon it or not, for its leaves are quite unlike those of other plants that you know. The leaves are always covered on both sides with a thick mat of gray or white wool. The leaves are long and very thick and have smooth edges. Some of them grow close to the ground in the form of a rosette, those in the center of the rosette being the smallest. The leaves that grow higher up on the plant are smaller than those that are near the ground, and they have no stalks. All the leaves are thick.

From the center of the rosette rises the tall straight stem of the plant, usually from three to five feet high. It is very woolly, and is not often branched.

At the top of the stalk are many pale yellow flowers crowded together in a dense spike. The flower-stalks are very short. Not all the flowers unfold at the same time, but those lowest down blossom first, while those at the top of the spike are still in bud.

Each flower has five spreading petals, with their bases united to form a very short tube. Inside the petals is a ring of five stamens. Two of the stamens have long stalks and large stamen-heads, while the other three have short downy stalks and small stamen-heads. At the back of the flower are five woolly, green, pointed sepals.



COMMON MULLEIN (2/5 nat. size)
Y = pale yellow

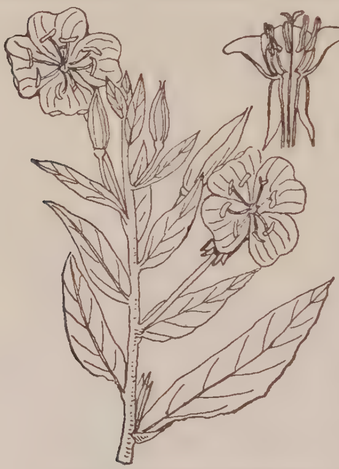
The Mullein plant is commonly seen along roadsides and unkept fields. The flowers bloom nearly all summer, and the leaves may be found every month of the year.

COMMON EVENING PRIMROSE

Oenothera biennis Linnæus

ONE of the tall wild plants that grow nearly everywhere, along roadsides and in waste places, is the Evening Primrose. It is so named because the flowers usually unfold toward evening and wither on the following day. Several flowers grow together near the top of the plant, and where each flower-stalk joins the stem, a leaf is also attached. The blossoms are pale yellow in color and are large and showy.

Each flower has four broad yellow petals, and each petal has a broad notch in its outer edge. Just inside the petals is a ring of stamens, usually eight, and the yellow stamen-heads swing easily when you shake the plant. Coming up in the center of the flower is a green thread which has four hairy lobes at the top. This is the top of the seed-vessel. Beneath the petals there are four very long, narrow sepals. At first there may appear to be only two, for they are usually found in pairs; but you can easily pull them apart, for they are united only at the tips.


COMMON EVENING PRIMROSE
(1/3 nat. size)

The flower appears to have a long stalk, but if you split this stalk open you will find that it is hollow, and in the center is the green thread which you saw coming up out of the flower. If you follow this green thread down to its lower end you will find that it is attached to the seed-vessel.

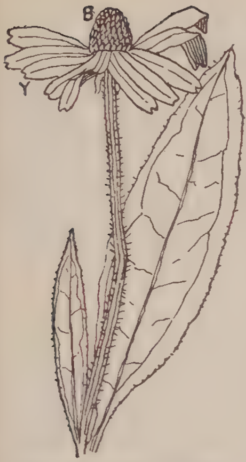
The leaves of the Evening Primrose are coarse and not very pretty. They usually have no stalks, and the edges are slightly toothed. The whole plant is often covered with coarse hairs which are sometimes sticky and catch the dust.

BLACK-EYED SUSAN

Rudbeckia hirta Linnæus

THE Black-eyed Susan is a plant, with large yellow daisy flowers, which is often found in fields and meadows. On the western prairies it often makes the fields yellow with its blossoms.

There is usually one large head of flowers at the top of the plant. The flowers on the outside of the head are much different from those in the center. The ring of ray-flowers on the outside have long, narrow, strap-shaped corollas, and at the outer end of each yellow strap are five tiny teeth. If you pull off one of the yellow straps you will see that it is folded together at the base and forms a short tube. The center of the flower-



BLACK-EYED SUSAN
(1/3 nat. size)
Y = deep yellow; B = brown

head is shaped like a thimble. The purple or brown flowers which form this thimble are so small that they do not look much like flowers. But by looking closely you may see that each of these tiny flowers has a brown tube with five small teeth at the top. In the center of the tube is the little cluster of stamens, and just below the tube is the green seed-vessel.

The plant is called the Black-eyed Susan because of the ring of yellow ray-flowers surrounding the head of purple-brown tube-flowers. Just below the flower-head, and attached to the end of the stem, are several very small leaves which are pressed close against the yellow rays.

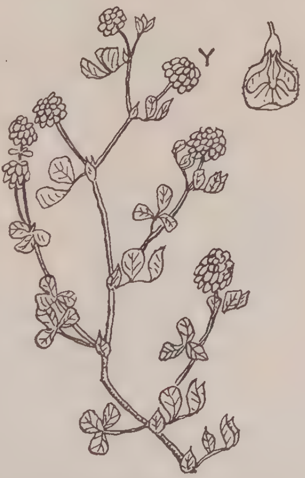
Most of the leaves of the Black-eyed Susan are near the base of the plant. These have slender stalks, but the small leaves near the top of the plant have no stalks. The edges of the leaves are usually smooth, but sometimes they have blunt teeth. The whole plant is rough and hairy.

Low or Smaller Hop-Clover

Trifolium procumbens Linnæus

The Yellow Clover is a common little plant which grows spreading on the ground in fields and in waste places. The tiny yellow flowers are clustered together at the ends of the branches, just as are those of the Common Clover. The heads are very small and each has from twenty to forty flowers.

If you take one of these tiny flowers from the head and pull it to pieces you will see that it is made up just like the Common Clover, but you may not be able to recognize all the parts unless you have a magnifying glass. There are five petals, ten stamens, and a very small seed-vessel just as in the other plants of the Pea Family. The calyx is a green tube with five teeth.



LOW OR SMALLER HOP-CLOVER
(1/3 nat. size)
Y = yellow

When the flowers begin to fade they do not fall off at once, but they shrivel and become pale brown in color. Sometimes you may find a head whose outer flowers are quite brown and withered, while those in the center remain fresh and yellow.

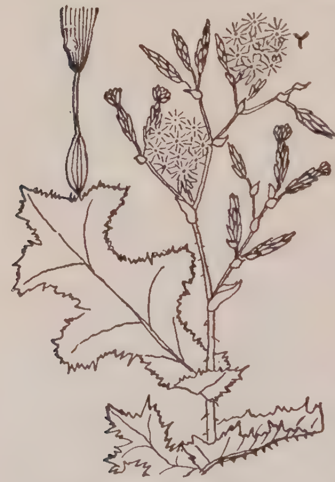
Each leaf has three oval green leaflets. The middle leaflet has a very slender stalk, but the other two usually have no stalks. All the leaflets have very finely toothed edges. The main stem of the plant is covered with fine downy hairs, and you will notice that wherever a leaf-stalk joins this stem there are two small green sheaths with points which look as though they were meant to cover the places where the leaves are attached.

Prickly Lettuce

Lactuca virosa Linnæus = *Lactuca scariola* Linnæus

You will find this weed growing almost everywhere. You can always know the plant because there are short spines scattered over the stems and the under side of the leaves. These spines are quite sharp, but not so sharp as those of the Thistle, and there are not so many of them.

The leaves of the Prickly Lettuce are divided into several lobes with toothed edges, and these teeth have very sharp points. The leaves have no stalks, but there are two lobes at the base of each leaf which fold around the stem. On the large vein on the under side of the leaf is a row of short spines. If you pick one of the leaves you will see a drop of milky juice coming from the broken place.



PRICKLY LETTUCE (2/5 nat. size)
Y = pale yellow, almost white

If the Prickly Lettuce is not too much shaded by surrounding plants, most of the leaves usually arrange themselves edgewise in a north and south position, so that the plant becomes a good compass-plant.

The pale yellow flowers of the Prickly Lettuce are crowded together, several in a head. They look somewhat like Dandelions, but are smaller and not so bright yellow. Each tiny flower has a yellow strap with five teeth at its outer edge. At the base it forms a short tube, and is attached to the seed-vessel. The flowers are surrounded by a number of small green leaves which lie close together and press the flowers into a head. There are several heads of flowers to each plant, for the plant branches at the top and there is a flower-head at the end of each branch.

When the seeds have formed, the head appears like a ball of down, just as you have seen in the Dandelion, but the ball is much smaller. If you pull the ball to pieces you will find that each tiny brown seed has a little stalk and at the end of each stalk is a ring of fluffy white hairs. If the seed is thrown up in the air it will be carried far away by the wind.

SPOTTED TOUCH-ME-NOT

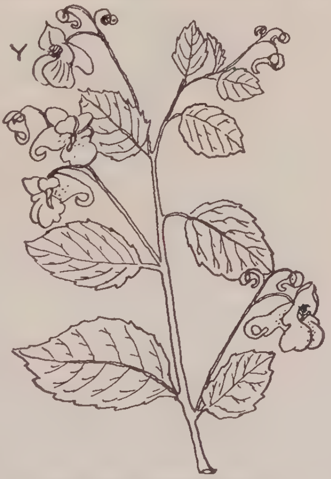
Impatiens biflora Walter

THE Touch-me-not is a common plant which grows in moist, shady places. You will find it abundant in woods and along brooks. The plant grows from one to four feet high, and has two, three, or four flowers together at the end of a branch.

The flowers are yellow or orange, with many brown spots, and are very odd. Each flower has a tube or horn with its tip very narrow, and folded back toward the mouth of the tube.

The stamens are very small and you may not recognize them at first. There are five of them all jointed together, and they are placed just above the opening of the tube. Within the ring of stamens is the green seed-vessel.

After the sepals and petals have dropped off, the seed-vessel grows into a pod with several ribs running lengthwise upon it. When the seeds are ripe the seed-vessel is much swollen, and if you touch the sides it will spring open with a snap and form tiny coils. The seeds were attached to these coils, but as the pod breaks open so suddenly the seeds are thrown far away and you may not be able to find them. This is why the plant is called Touch-me-not.



SPOTTED TOUCH--ME--NOT
(2/5 nat. size) Y = orange yellow

The leaves are ovate in shape and have toothed edges. Their stalks are very slender. If you put a leaf in water it will look silvery, and for this reason the plant is often called jewelweed or silver-leaf.

Wild Mustard or Charlock

Sinapis arvensis Linnæus = *Brassica arvensis* (Linnæus) Kuntze

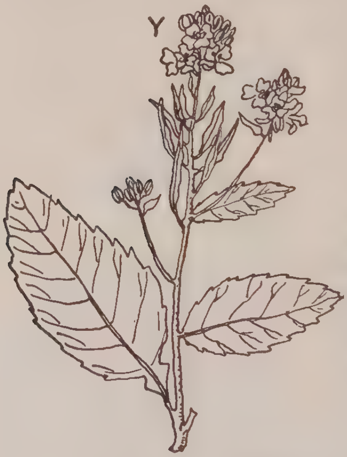
You can hardly go out of doors in the summer without seeing in the fields the yellow flowers of the Wild Mustard. But the farmers are sorry to see it, for it is very harmful to their grainfields and pastures.

The plant is stiff and branching and the flower-clusters are at the ends of the branches. There are usually four or five flowers in full bloom at once, arranged around a bunch of green buds which rises in the center of the cluster. While the first cluster is in flower the stem continues to grow, and when these first flowers have fallen off, another cluster appears at the end of the stem.

Each flower has four yellow petals which are arranged in the form of a cross. If you pull off one of the petals you will see that the lower part is narrow and strap-shaped, but the upper part is broad and rounded, with a notch in the outer edge.

If you pull the petals apart you will see the heads of four stamens, and if you look farther down you will see two other stamen-heads which have shorter stalks. The seed-vessel is very short and is hidden until the petals and stamens have fallen off. Then it grows into a long, thin pod filled with tiny, brown, peppery seeds. You will see many of these slender pods standing out from the stem. Below the petals are four thin sepals.

The leaves of the Wild Mustard are dusty green. Those near the flowers are narrow and have smooth edges, but the ones near the ground are large and deeply notched.



WILD MUSTARD OR CHARLOCK
(1/3 nat. size.) Y = yellow

California Poppy

Eschscholtzia californica Chamisso

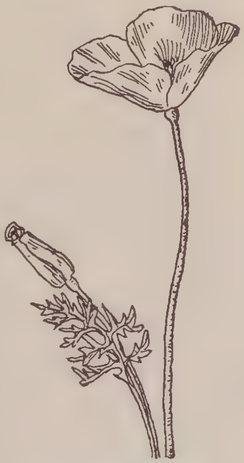
Boys who live near the western coast of the United States know the California Poppy as a common wild flower, but those of the east see it only in gardens where it is cultivated for its beautiful flowers. Where it grows wild it makes whole fields look yellow with its bright blossoms.

Each Poppy flower has four petals, two of which are much larger than the other two. They all fit tightly together so that you cannot see between them. The corolla is shaped like a cup, broad at the top.

Each flower has many stamens. The stamen-stalks are very short, much shorter than the yellow stamen-heads. In the center of the flower is the green seed-vessel with a short stalk rising from it.

If you look beneath the petals you will see that there are no sepals, but if you look closely you may see where the sepals have been attached. If you find a bud you will see that it is covered by the two pointed green sepals, with their edges close together, so as to form a cap. As the petals grow and spread out the cap is pushed up, and soon drops off.

The leaves of the California Poppy are much cut up into narrow parts, and sometimes each part is forked. The leaves are gray-green in color, and have a white bloom which easily rubs off. Most of them spring from the base of the plant.



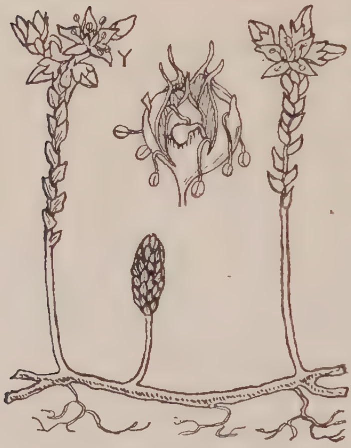
CALIFORNIA POPPY
(1/3 nat. size)

Mossy Stonecrop

Sedum acre Linnæus

This is a common little plant that you will find planted on the rocks and sandy places in flower-gardens, and for this reason it is called the Stonecrop. It grows in large tufts close to the ground.

The plant is much branched, and the branches are of two kinds. Some are thickly covered with thick watery leaves. These leaves are very small, and are laid closely upon the stem like shingles upon a house. Those leaves nearest the ends of the branches are often tinged with red. On other branches of the Stonecrop the leaves are much the same but



MOSSY STONECROP (2/3 nat. size)
Y = light yellowish green

they are not packed so closely together. The leaves are thick and watery so as to keep them from drying out as the plant grows upon the dry, hot rocks.

At the end of each branch is a cluster of small flowers. These flowers are golden-yellow and each has five pointed petals which resemble the rays of a star. There are ten yellow stamens which lie flat out, one on each petal, and one between each two petals. In the center of the flower stands the fat little seed-vessel. After the petals have withered and fallen off, the seed-vessel lies down and shows five points like a small green star. There are five sepals which have their bases united.

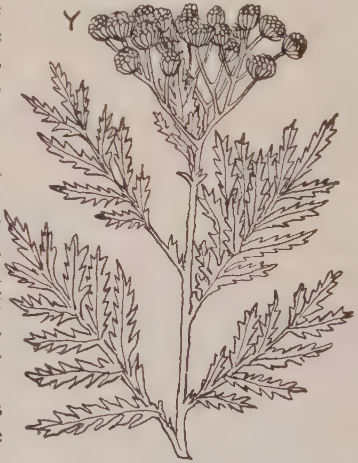
TANSY

Tanacetum vulgare Linnæus

THE Tansy is found growing in dense patches along roadsides and on the borders of old fields and yards. It is a tall, bushy plant, sometimes two or three feet high, and it flowers in late summer and autumn.

The Tansy plant has a green stem rising stiff and straight from the root, and this stem branches toward the top into three or four forks. Each of these forks divides again into several smaller branches, and at the end of each of these smaller branches is a yellow flower-head which looks somewhat like a button.

If you pull one of the flower-heads to pieces you will find that it is made up of very many yellow tubes, each having a little green seed-vessel at



TANSY (4/9 nat. size)
Y = yellow

its base. The yellow tubes are of two kinds. Some are evenly notched around the mouth, but others have a yellow strap at one side of the tube. Each yellow tube is really a flower, and they are attached to a round disk. At the back of this disk is a double row of small, pointed, green leaves which form a cup behind the yellow heads.

The leaves of the Tansy are dark green and fern-like. They are shaped somewhat like a feather, and the parts into which they are divided are toothed around the edges. The whole plant has a bitter taste and a strong odor. The odor is more noticeable when the stalks or leaves are crushed.

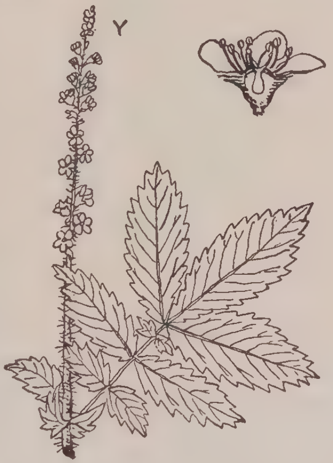
Tall Hairy Agrimony

Agrimonia gryposepala Wallroth

This plant likes to grow in woods and thickets. It has a leafy, branching stem and grows from two to six feet high. The flowers are small and not very attractive. They look like small yellow stars and are arranged one above another on a tall spike. Those lowest down on the spike open first, while the small green buds are crowded together at the tip.

Inside the five lemon-yellow petals is a ring of stamens, and among the yellow stamens stands the fat green seed-vessel with two horns at the top.

The calyx, or green covering of the flower, is the part you should notice most closely. It rises from a short stalk and is shaped like a bell. There are ten deep lines running from the top to the bottom of this green bell, and around the top are five large points. Below these points is a curious ring of tiny hooks, like a fringe, and these cling to whatever touches them. You may find many of these little green bells fastened to your clothing if you have been where the Agrimony grows. This is the way the plant scatters its seeds, for the seeds are on the inside of this bell.



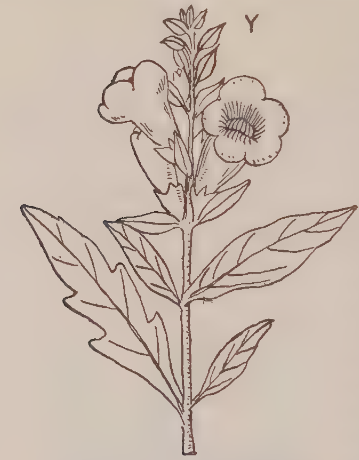
TALL HAIRY AGRIMONY
(4/9 nat. size) Y = yellow

The leaves are dark green and are made up of many hairy leaflets which grow opposite each other and in pairs on each side of the leaf-stalk—first a large pair, then a small pair, turn about. There are usually five to eight pairs of leaflets to each leaf, and there is always one large leaflet at the end. The edges of the leaflets are deeply toothed.

Downy False Foxglove

Dasystoma flava (Linnæus) Wood = *Gerardia flava* Linnæus

This is one of our handsome wild flowers. It grows abundantly in woods and fields and on banks, and blooms all summer and autumn. It is a tall plant with a very stiff stem, from one side of which hang beautiful yellow bell-shaped flowers



DOWNY FALSE FOXGLOVE
Y = yellow

These yellow bells are daintily scalloped around the mouth into two lips. The upper lip curves backward and the lower lip has three lobes, the middle one being largest. When you look down into the mouth of one of these bells you will see that there are four stamens, two having long stalks and two having short stalks. Each stamen has a large yellow head and clings to the side of the bell by its slender stalk. In the center of the flower is a swollen green seed-vessel and from it rises a slender yellow thread. Behind each bell there are five green sepals with sharp points; before the flower unfolds, these green sepals cover the petals so that all you may see is a tiny green ball for the bud.

Each flower has a short stalk and where this stalk joins the main stem of the plant there is a small green leaf. The flowers are about an inch long; those lowest down on the stem blossom first.

The Foxglove leaves are broad and long and are pointed at the tip. They are gray-green in color and the under side is hoary with soft white woolly down. Each leaf is covered with a network of fine veins. The leaves toward the base of the plant have stalks and are crowded close together, while those further up have no stalks and are scattered on the stem.

CANADIAN, OR WILD YELLOW, LILY

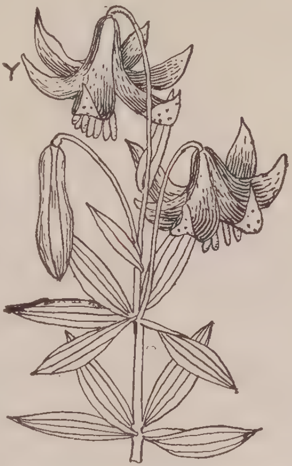
Lilium canadense Linnæus

YOU may think from the name of this plant that it grows only in Canada, but it is found very commonly in many States of our own country. The stem grows from two feet to five feet high and is usually green and slender. At the top of this stalk you will find one or several large yellow buds and flowers. Each flower has a slender stalk which is curved at the top so that the flower hangs drooping.

Each flower has six long narrow divisions. These divisions are pointed at the tips and fit closely together where they are attached to the stalk. On the outside these divisions are yellow, while on the inside they are bright orange with many dark purple spots. You will find many more of these dark spots toward the base of the divisions than toward the tips.

Each flower has six stamens with long slender stalks. The stamen-heads are much shorter than their stalks, and are attached so as to swing back and forth when they are touched.

You may find flower-buds near the open flowers, and if you look closely you will see that there are three outer parts which fold tightly around the inner ones.



CANADIAN, OR WILD YELLOW, LILY (4/15 nat. size)

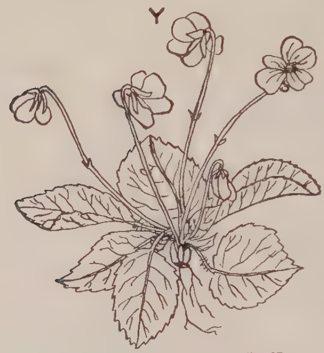
After the flower has withered, the flower-stalk begins to straighten, and when the seed-vessel has grown to its full size it stands straight up instead of drooping as it did in the flower. When the seeds are ripe the seed-vessel splits open and you will see inside many rows of brown seeds.

ROUND-LEAVED, OR EARLY YELLOW, VIOLET

Viola rotundifolia Michaux

THIS violet is found on woody banks and in swampy places early in the spring. If you pull the flower to pieces you will see that it is much like the Blue Violet.

Each flower has five yellow petals with tiny purple or brown lines upon them. The two upper petals are alike, and the two side petals are like each other, but the large lower petal is swollen into a short tube near the place where it is attached. This tube extends backward between the sepals. In this tube is a drop of nectar, and this is why the bees so often visit the flowers.



EARLY YELLOW VIOLET
(1/2 nat. size) Y = yellow

After the petals have been taken off you will see the five pointed, green sepals, and in the center of the flower are the five tiny stamens with their heads close together forming a very short tube. Coming out from among the stamens is a short green rod with a little knob at the end. This is the top of the seed-vessel.

Each flower is on a slender hairy stalk which is attached to the main stem just above a leaf. There may be as many as five flowers on a single plant. The leaves are rounded.

When the petals and stamens have fallen off, the seed-vessel becomes as large as a big pea. When it splits open you will see a great number of small seeds, nearly white in color.

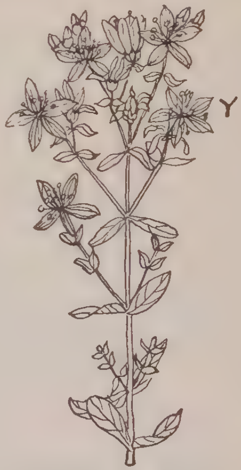
Common St. John's-Wort

Hypericum perforatum Linnæus

This is a common plant growing a foot or more high, whose flowers appear late in summer. It may be found in little clumps along roadsides and in pastures.

The flowers grow in short stalks which always rise between a small green leaf and the stem of the plant. These stalks are in pairs, exactly opposite each other on each side of the stem.

Each flower has five yellow, pointed petals which open like the rays of a star, and on these petals are often many black dots. Inside the petals are many yellow stamens. These are sometimes arranged in bunches, and sometimes they



COMMON ST. JOHN'S-WORT (2/5 nat. size)
Y = bright yellow

form a ring around the seed-vessel. By pulling back the stamens you may see the pear-shaped seed-vessel with three horns at the top. At the back of the flower, lying flat open, are the five thin green sepals whose tips can be seen between the petals as you look down on the flower.

The green leaves of the St. John's-wort grow in pairs, opposite each other. Each tapers to a point and has its edges smooth all around. There are no leaf-stalks. If you pull off a leaf and hold it so the light shines through it you will see many tiny dots scattered over it.

There is one kind of St. John's-wort which has a square stem with four edges. Some plants have flowers about the size of a cent, while the flowers of other plants are only half as large.

BELLWORT

Uvularia perfoliata Linnæus

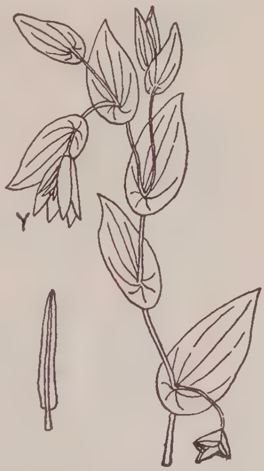
YOU will find the Bellwort growing abundantly in low woods and thickets. It is one of the common plants that bloom in the springtime.

The flowers are very pale yellow and droop downward on slender curved stalks. Each flower has six narrow parts which are pointed at the tips.

Just inside the perianth you will find the six stamens, each stamen opposite a perianth-segment. The stamen-heads are long, but the stamen-stalks are shorter than the heads. At first the stamen-heads are the same color as the petals, but when they burst open you will see them covered with dusty yellow pollen.

In the center of the flower is the seed-vessel with the seeds at the bottom. After the perianth and stamens have withered and fallen off, the seed-vessel becomes much larger and has three corners.

The leaves of the Bellwort are ovate in shape and have many veins running from base to tip. The edges are smooth. None of the leaves have stalks, in fact, they extend all the way round the stem, so that the stem seems to grow right up through the leaf.



BELLWORT (1/3 nat. size)
Y = pale yellow

The stems often grow to be a foot high, and are forked at the top.

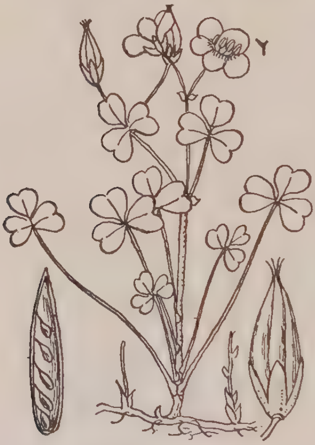
If you pull up the plant you will find a long thick root just beneath the surface of the ground. It is about as large as a pencil and has fine threads branching from it.

LADY'S SORREL

Xanthoxalis corniculata (Linnæus) Small = *Oxalis corniculata* Linnæus

THE dainty Lady's Sorrel or Sheep Sorrel is found in damp woods and fields. The flowers grow singly or in clusters at the ends of very slender stalks. They are nodding and have no odor.

Like the Buttercup, the flowers of the Sheep Sorrel have each five yellow petals, but they are not so large as the Buttercup. When the sun shines on the plant the petals open out almost flat, but they fold up again when night comes or when it rains.



LADY'S SORREL (4/9 nat. size)
Y = yellow

In the center of the flower is a ring of ten yellow stamens, five of them having long stalks and the other five having short stalks. Within the ring of stamens is the short green seed-vessel. Behind the yellow petals is the tiny green calyx-cup, which is made up of five sepals. There are five sharp points around the edge of this cup.

You can easily learn to know Lady's Sorrel by its pretty leaves. Each leaf is made up of three delicate leaflets which are pale green on the upper side and are sometimes purplish beneath. These leaflets are heart-shaped, with the notch at the top. When darkness comes, or when it rains, they droop close to the stem. If you taste one of the young green leaves you will find that it has a sour but not unpleasant taste.

GOLDEN RAGWORT

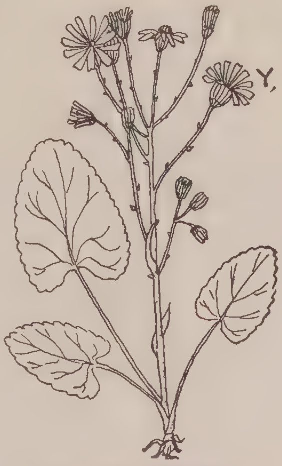
Senecio aureus Linnæus

GROWING in swamps and wet places in the springtime you will find the Golden Ragwort. Sometimes so many plants grow together that they make the fields and pastures golden yellow with their bright heads.

The plant is a member of the large Composite Family, and so has its tiny flowers put closely together in heads. Each flower-head has a ring of yellow strap-flowers on the outside. These straps are blunt and often have small teeth on the outer edge. At the base each strap is folded so as to form a short tube. Inside this ring of strap-flowers are many small tube-flowers crowded together. Each of these brown or yellow tubes has five tiny teeth at the top, and coming out of the tube is a yellow thread which is split at the top. By looking very closely you will see that this yellow thread is larger below the place where it is split. It is really made up of the tiny stamen-heads joined close together. If you pull off a single flower of the Golden Ragwort you will find the tiny seed-vessel at the bottom, and where the seed-vessel is attached to the tube there is a ring of soft white hairs.

Each head of flowers has a long stalk with several tiny leaves upon it. At the top of the stalk, and just below the head of flowers, is a green cup made up of several long, narrow, pointed leaves joined closely together. After the flowers wither, this cup folds over the tiny seed-vessels.

The leaves that are near the ground are rounded and the edges have blunt teeth. These leaves have long slender stalks, but the leaves higher up have no stalks. The stem-leaves are long and narrow and their edges are deeply cut.



GOLDEN RAGWORT
(2/5 nat. size) Y = golden yellow

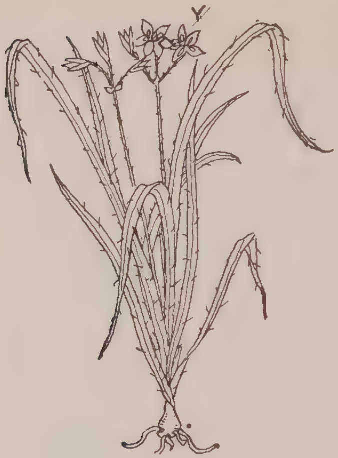
STAR GRASS

Hypoxis hirsuta (Linnæus) Coville

SOMETIMES you see the open woods and waste places thickly dotted with star-shaped yellow flowers peeping up among the blades of grass. If you examine a single plant you will find that there are a few of these yellow flowers growing together in a cluster at the stop of a short stem. Each flower has a short hairy stalk of its own.

Each flower has six perianth-segments which are arranged like the rays of a star. They are narrow, and are pointed at the tips, on the under side they are green and hairy. There are six yellow-headed stamens, each standing opposite a perianth-segment.

In the center of the flower is the narrow, hairy, green seed-vessel. When the flower withers the perianth-segments roll up and fold tightly around the seed-pod. If you break open the seed-pod you will find it filled with many tiny seeds which are black when ripe.



STAR GRASS (1/3 nat. size)
Y = bright yellow inside, green and hairy outside

The leaves of the Star Grass are very much like the grass-blades which grow in fields and meadows. They are long and narrow, with smooth edges, and have a single large vein running from base to tip. They are not so smooth and green as the grass-blades are, for they are covered with many long gray hairs.

The leaves and flowers of the Star Grass grow from a small white bulb which is below the surface of the ground. This bulb has many long white thread-like roots attached to it.

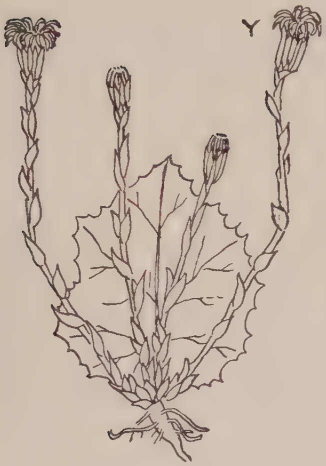
Colt's-foot

Tussilago Farfara Linnæus

The Colt's-foot is one of the plants that are found very early in the spring. The flowers appear before the leaves, usually in March or April. They grow singly at the ends of straight woolly stalks which have many little pink scale-like leaves from top to bottom.

The flowers are bright yellow, and as in the Daisy and the Paint-brush, which belong to the same family, there are a great many tiny flowers grouped together, forming a head. The flowers around the outside of the head are like long, narrow, yellow straps folded together at the base. Just below the yellow corolla is a tiny seed-vessel. The flowers in the center of the head are like little tubes, with five tiny teeth at the top.

When the flowers wither the heads droop, but the seeds remain at the end of the flower-stalk, and each seed sends out a tuft of straight, white



COLT'S-FOOT (1/3 nat. size)
Y = bright yellow

down. This down forms a delicate ball, just as you have seen in the Dandelion, but the down-ball of the Colt's-foot is neither so starry nor so beautiful as that of the Dandelion. After the seeds have all been blown away there remains at the top of the stalk the tiny narrow leaves which were pressed close against the head of flowers.

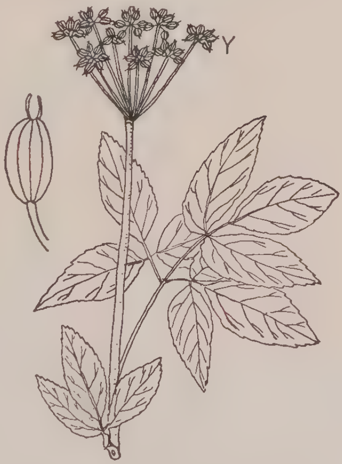
The leaves of the Colt's-foot are entirely covered with woolly hairs when they are young. As they grow larger they become glossy gray-green above, and are white only on the under side. The leaf is nearly round and is shaped somewhat like a colt's foot. Perhaps this is why the plant is so named. The edges of the leaves are beautifully scalloped, and the leaf-stalks are long and slender. The leaves often form large patches by the roadsides.

Golden Meadow-Parsnip

Zizia aurea (Linnæus) Koch

You will find the Golden Meadow-parsnip growing in fields and along fences throughout the spring and summer. Sometimes there are so many plants together that their bright flowers make the fields look yellow. The flowers usually appear in greatest abundance in mid-summer.

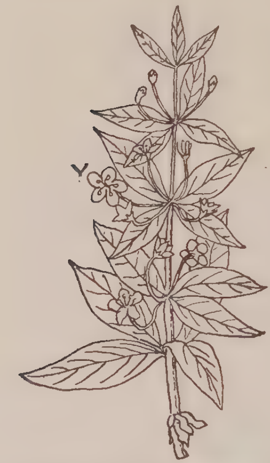
The flowers grow in clusters at the ends of short stalks, and several of these stalks are attached together at the ends of the branches. The stalks are stiff and stand out in all directions.



GOLDEN MEADOW PARSNIP
(1/3 nat. size) Y = yellow

Each tiny flower has five yellow petals, and there is a little notch in the outer edge of each petal. There are five short, yellow stamens which spread out almost as much as the petals. Each stamen is attached between two petals. In the center of the flower are two thread-like branches which come from the seed-vessel. The seed-vessel is a green swelling below the petals. When it is older it has ridges upon it and is very rough.

The leaves of the Meadow-parsnip are made up of many leaflets which are downy on the under side. The leaflets have toothed edges and some of them are stalked. Where the leaf is attached to the stem of the plant, its stalk is flattened out and folds around the stem. Most of the leaves are close to the ground, and these have more leaflets than those which are near the flowers.



LOOSE-STRIFE (1/3 nat. size)
Y = pure yellow

Loose-Strife

Lysimachia quadrifolia Linnæus

This common plant is found growing in woods and thickets, in waste fields and pastures and along roadsides. The Loose-strife is one of the plants that you can easily learn to know, because its leaves are arranged four together, in a circle around the stem. There are several of these circles placed along the stem from the top to the bottom of the plant. Sometimes the leaves are arranged in pairs, for there are many different kinds of Loose-strife. Each leaf is ovate and has a smooth margin. It is pointed at the tip and has no stalk.

The yellow flowers of the Loose-strife are borne on slender stalks which come from the main stem just above where a leaf is attached. Each stalk usually has but one flower, but in some Loose-strifes the flowers are in clusters. Each flower has five ovate yellow petals with dark spots or streaks upon them. These petals are joined together at the base, and if you pull them off you will see that the five yellow stamens are attached to the lower parts of the petals. When the flower is fully opened the petals spread out almost flat.

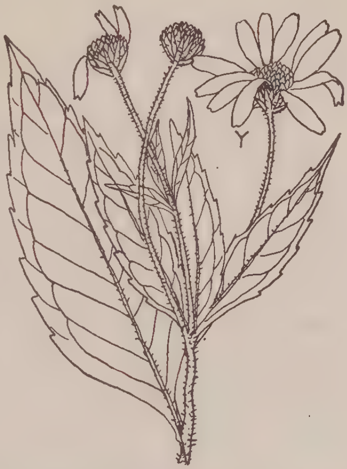
In the center of the flower is the round green seed-vessel filled with tiny seeds. At the back of the petals are the five pointed green sepals. They have their bases united to form a very short tube.

The stem of the plant is stiff and straight and grows from one to two feet high. It has four ridges upon it, extending up and down. These ridges are sometimes covered with fine hairs.

JERUSALEM ARTICHOKE

Helianthus tuberosus Linnæus

You all have in mind what a wild sunflower looks like, with its tall, straight stem, big leaves, and showy flowers, reminding you of a giant yellow daisy. Now, this Jerusalem Artichoke is really nothing more than a fine, large, wild sunflower, which is often found growing along the roadside, or by fences. Some people even call it the Wild Sunflower, and it has other names, such as Earth Apple and Canada Potato, because its roots are good to eat. It has been planted in gardens for its roots, which taste like celery roots or like common salsify.



JERUSALEM ARTICHOKE (1/3 nat. size)
Y = dull yellow

The earliest colonists in this country knew of these artichoke roots, and it was a long time before the common potato took their place as food. Ages ago, the American Indians also liked the artichoke roots, and told the first settlers about them. Then, in those early days, it was sent over to Europe to be planted in the gardens of England and Italy; and from the curious name the Italians gave the roots, we got our word Jerusalem—a place, doubtless, where the plant has never been seen. Boys will sometimes eat the roots of this artichoke without even washing or cooking them. They are easily found, for the plant may grow to be at least twelve feet high, while the dozen to twenty yellow rays and dull yellow disk, around which they form a circlet, may be seen a long ways off. Its big leaves are rough, pointed, and saw-edged, and the flowers often last some time after Jack Frost has paid his first visit.

Artichokes grow best in a moist soil, but they will not thrive in a very wet one. Our giant sunflowers of the gardens seem to like a drier place in which to grow. The Black-eyed Susan or Cone-flower, which you all know so well, is also a relative of the artichoke, as are several other kinds of wild sunflowers and many other plants, looking more or less like our abundant Ox-eye Daisy of the meadows and fields. As a rule, they all have a disk-like center composed of many dozens of the true, minute flowers of the plant; these are surrounded by the rays, which, as you know, are white in the daisies and yellow or orange in the sunflowers. Our Arnica is also a daisy-like flower with pure yellow rays, and we meet with it in the cold climate of our mountains of the North. All such flowers, and many hundreds of other kinds more or less like them, form, as you already know, one big family, which has been called the Composite Family, for the reason that the disk—such as the central, yellow part of the daisy—is a compound or composite part, made up of a large number of tiny flowers.

YELLOW LADY'S SLIPPER

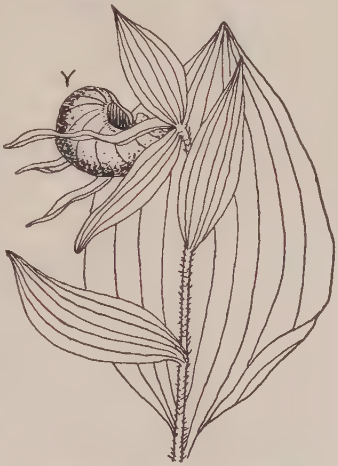
Cypripedium parviflorum Salisbury

WE have many beautiful flowering plants in our Orchis Family, as the Showy Orchis, the Tway-blade, Rattlesnake Plantain, and others; but none of these is nearly so interesting, much less so beautiful and showy, as our famous Moccasin Flowers, of which there are several kinds. In the parts where they are found many people know them well—so well indeed that some boys and girls, who have already paid some attention to flower-study, call them by their scientific name of Cypripedium, which, though incorrectly spelled, means Venus' Shoe. Well, from Venus' Shoe we have Lady's Slipper, and from this again Moccasin Flower, from the kind of shoe the American Indians used to wear, which really has some resemblance to the sac-like lip of one of these plants, be it the Yellow, White, Pink, Showy, or Stemless one.

You have probably studied some of these Lady's Slippers, and you doubtless know them when you come across them in the swamps and other wet places, and in rich woods where they grow.

Our Ram's Head Lady's Slipper is a rare one, and found only in a few places. You will be lucky should you come across one, and it will well repay you to press and save it for your collection of plants. The two Yellow kinds—that is, the Smaller and Larger Yellow Lady's Slipper—are far more common, the last being found chiefly in the woods, while the Smaller one is usually a plant of the bogs and swamps. You would be almost safe in saying that we have but one Yellow Lady's Slipper, and that it varies to some extent in the size of its flowers.

It is hardly necessary to say that the flowers of these two kinds are yellow, for the name suggests that, and not pink or pale carmine as in some others. In fact, they are large and very showy; and, instead of being single, as some say, you may meet with plants where two big, perfect flowers surmount the stem. This last is leafy, and comes to be one or two feet high. Two of the flower's three sepals are united, being of a greenish-yellow color, finely lined with purplish-red; they are, you will see, long and narrow. Above, sticking out, one on either side, are longish, narrow and twisted brown curls, each of which is a petal. The third petal is transformed to make the "slipper" or inflated sac of the flower. This is about two inches long, open at the top, and colored as already described; in some places within it is lined with fine, white hairs. You will see that the leaves clasp the stem, being large, oval, pointed, and parallel-nerved or lined, as in many other orchises.



YELLOW LADY'S SLIPPER
(1/3 nat. size) Y = showy yellow

The Lady's Slipper is found under evergreens and among withered leaves that lie under birch, beech, poplar, and maple. The time of flowering for both varieties is early in the summer.

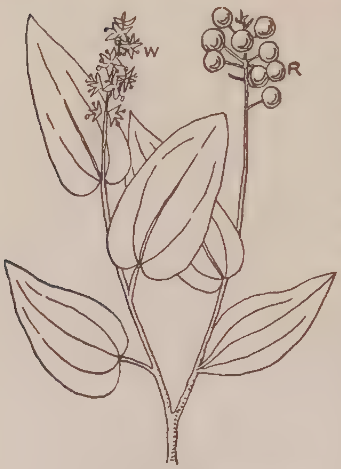
WHITE FLOWERS

False Lily-of-the-Valley

Unifolium canadense (Desfontaine) Greene = *Maianthemum canadense* Desfontaine

This plant does not look like the Lily-of-the-Valley, but we call it False Lily-of-the-Valley because it is closely related to the true. It is found very commonly growing at the bases of trees and in wet places in the woods.

The tiny flowers of the False Lily-of-the-Valley are white but are not shaped like those of the real Lily-of-the-Valley. Each flower has four



FALSE LILY-OF-THE-VALLEY
(1/2 nat. size) W = white; R = pale red

white perianth-segments which spread flat out. Opposite each one of the segments is a stamen with a rounded head and a long stalk which is nearly as long as a petal. Standing straight up in the center of the flower is the seed-vessel. It is shaped somewhat like a bottle. Each tiny blossom has a short stalk of its own which is attached to the main stalk.

You can easily learn to recognize the False Lily-of-the-Valley because it usually has two leaves attached on opposite sides of the stem, one slightly above the other. These leaves are ovate in shape, but at the base they are heart-shaped. They usually have no stalks.

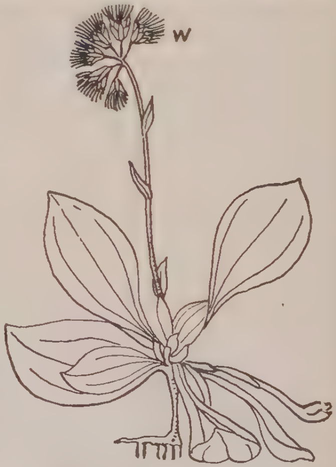
If in the summer or autumn you will visit a place where you have seen the False Lily-of-the-Valley blooming in the spring you will find that each seed-vessel has become a round pale red berry, speckled all over.

EVERLASTING

Antennaria sp.

THE Everlasting is a common plant which grows in fields and pastures and on dry hillsides nearly all over the country. Many plants grow near together and form thick patches of white flowers.

The small white flowers are arranged in heads, and around each head are several rows of white pointed leaves which look much like petals and which fold over each other. The lower leaves are spreading and are not pressed close against the others. At the top the plant branches into many small stalks, and at the end of each stalk is one of the white flower-heads.



EVERLASTING (1/3 nat. size)
W = light green with white tips or pinkish tips

Each separate white flower has a little tube with five small teeth on the edge, just as in the Thistle or the Daisy. The tiny stamens may be seen in the center of the tube. If you pull the head to pieces you will find at the bottom of each flower-tube a hairy, green seed, and at the top of the seed a ring of white hairs. When the corolla has withered and the seed falls out of the head these hairs help to carry it a long distance in the wind.

The leaves of the Everlasting are long and narrow and are covered with white woolly down on the under side. They have smooth edges and are pointed at the tips. The stem of the plant is also covered with loose white wool.

If you gather the flowers the white heads will remain for several months just as when you picked them. This is why the plant is called the Everlasting.

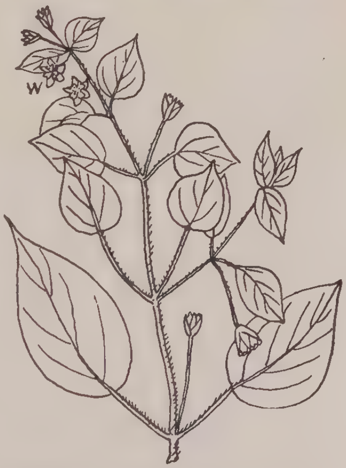
Common Chickweed

Alsine media Linnæus = *Stellaria media* (Linnæus) Cyrill

The Common Chickweed is found almost everywhere. It grows in fields and gardens and in waste ground, and you may find its flowers and green leaves nearly every month in the year. It is a feeble, creeping plant and forms green masses near the ground. It does not grow well in dry, stony places, but in untidy gardens where there is good soil the plants are larger and have many white flowers and green leaves.

The white flowers are small, and each has five tiny petals which are deeply notched at their outer edges. There are five small green sepals with sharp points which show like the rays of a green star behind the petals. Inside the petals are the yellow stamens, and in the very center of the flower is the tiny seed-vessel.

Each flower grows at the end of a stalk which rises between a leaf and the main stem. If you look at the stem closely you will see a line of fine hairs running down one side, and if you break the stem you



COMMON CHICKWEED (2/5 nat. size)
W = white

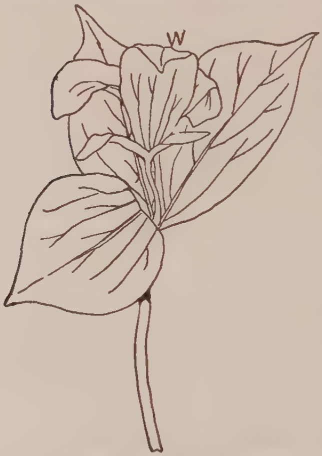
will find that there is a green thread inside which is more difficult to break than the soft green covering. The stems are usually branched.

The Chickweed leaves are oval in shape, and have smooth edges. They grow in pairs and are attached to the stem by short stalks. The birds and chickens like to eat the fresh green leaves of the plant, as well as the tiny brown seeds.

WAKE-ROBIN

Trillium sp.

THIS well-known plant is found growing in woods and fields where the ground is moist. Sometimes it is so abundant that you can gather all that you can hold in your arms, but often you will find a single plant growing alone. The flowers are large and beautiful, and are white, red, or pink in color.



WAKE-ROBIN (4/9 nat. size)
W = white, red, or pink

Each flower has three large petals which are pointed at the tips and there are many veins running from the base to the tip of each petal. As you look down on the flower you will see the three green sepals between the petals. These sepals are pointed, and their bases are joined together.

Just inside the petals are the six long yellow stamen-heads, each one attached to a short stalk. Inside the ring of stamens is the fat green seed-vessel with three slender feathery branches coming from the top.

You can easily know a Wake-robin when you see it because of the leaves. Each plant always has three leaves, and these are arranged in a ring or circle around the stem just beneath the large flower. Each leaf is broad and rounded with a pointed tip, and usually has no stalk. The edges are smooth, and numerous veins may be seen running all through the leaf.

CONE FLOWER AND FIELD DAISY

The coneflower is also known as black-eyed-Susan, yellow daisy, ox-eye daisy, cornflower and golden Jerusalem

WHITE WATER-LILY

This is the common water-lily of temperate North America, but there are many color-hybrids

Sweet-scented White Water-Lily

Castalia odorata (Dryander) Woodville & Wood

Instead of growing on the land as most plants do, the White Water-lily chooses its home in ponds and small lakes. It is our prettiest water-loving flower, as it sits floating on the surface of the water among its broad green leaves. The flowers are much prettier just as they are growing, but if you can get one you will find that it is very interesting to study.

Each flower has many smooth, white, ovate petals, which are arranged in several circles, and outside of these are four or five green sepals, much like the petals in shape. In the center of the flower are many stamens. Some of the stamens are broad like petals, and perhaps it will not be easy for you to tell whether they are petals or stamens. Inside the rings of stamens is the large round green seed-vessel. It has many small openings through which the seeds come out when they are ripe. You may not be able to find the seeds, for they are always under the surface of the water. Each seed is in a tiny bag which opens at the top.

Hidden somewhere among the stamens are very small sacks which contain nectar. This is why the bees visit the flowers so often.

The stem of the White Water-lily is round and hollow and is not strong enough to hold the flower straight up. Each plant has several leaves which rest on the surface of the water just as the flowers do. The leaves are like flat plates, and are purple on their under sides. The leaf-stalk is attached at about the center of the leaf.

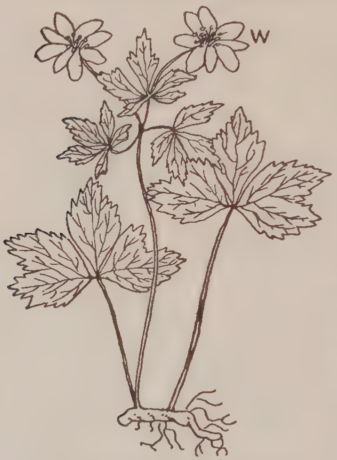
SWEET-SCENTED WHITE WATER-LILY (1/3 nat. size) W = white

Wood Anemone

Anemone quinquefolia Linnæus

This is one of the daintiest of our wild plants. You will find it in patches in the early spring in the woods where the sun has cast its rays between the branches of the trees.

The flower has five, six, or seven delicate white sepals. These are rather long and narrow, and on the under surface they are sometimes tinged with pink or purple. The buds are usually quite pink before they unfold.



WOOD ANEMONE (4/15 nat. size)
W = white

Within the pink and white sepals are many stamens with their little yellow heads set on stalks as fine as a hair, and in the center of these stamens is a small green knot of seed-vessels.

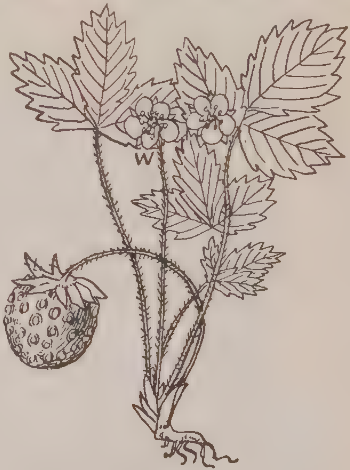
The flower of the Wood Anemone grows singly on a smooth slender stalk which rises from the center of three soft, dark-green involucral leaves. These leaves are each divided into three or five parts which are deeply cut up around the edges, and their short stalks are covered with fine hairs. The flower-stalk is so slender that the blossom easily nods in the breeze.

About the time that the flower withers a second set of leaves appears, rising straight from the root of the plant. These leaves are divided much the same as the first ones. If you dig up the root of the plant you will find it like a rough, brown bit of stick. It creeps along under the surface on the ground instead of going straight downward, and you can see that the flower and the first set of leaves rise at a different part from the stalk which bears the other leaves.

Wild Strawberry

Fragaria virginiana Duchesne

The Wild Strawberry is common in fields and meadows, along roadsides, and in woods and fence-corners. This pretty plant is related to the Wild Rose, and has white flowers arranged in loose clusters.



WILD STRAWBERRY (2/5 nat. size)
W = white

The flower has five white petals, which are broader and often notched at the outer edge. Below the petals is the star-shaped calyx, made up of five pointed green sepals and five bracts. The sepals are large and can be seen between the petals as you look down on the flower, but the bracts are smaller, and can only be seen at the back of the flower.

There are many stamens standing in a thick ring around the seed-vessels, and they do not fall off when the petals wither, because they are joined fast to the sepals. When the flower has withered, the receptacle below the seeds in the center begins to grow, and swells into a beautiful bright red berry. You can see the tiny yellow seeds still clinging to the juicy berry, and when you pick the berry the green calyx may pull off with it.

The dark green leaves of the Wild Strawberry are beautiful. They are slightly crinkled, and the edges are cut into large teeth with soft hairs upon them. Each leaf is made up of three leaflets.

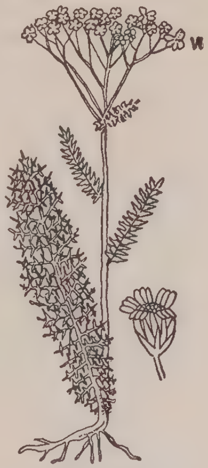
The plant sends out long green shoots which lie close to the ground. Wherever a tuft of leaves rises from one of these shoots a little cluster of white roots grows down into the ground, and these help to keep the plant steady.

Yarrow or Milfoil

Achillea Millefolium Linnæus

In pastures, fields, and lawns you will find the Milfoil growing in dense patches. The straight stiff stem grows about a foot or two high and branches at the top. The plant blooms in summer and autumn.

The flowers of the Milfoil resemble small Daisies, and there are a dozen or more growing together at the top of the main stem. Each daisy flower has a slender, hairy stalk of its own. Around the edge of the flower-head is a circle of white ray flowers, each having a notch in the outer edge of the strap. Within this circle is a flat disk covered closely with greenish-white tube flowers, with teeth around their upper edges. These teeth bend outward. If you look closely you may see coming out of the center of each flower-tube the yellow tip of the seed-vessel. The heads of the stamens are placed edge to edge, like a deep collar around this yellow tip.



YARROW OR MILFOIL
(2/5 nat. size) W = white
(sometimes pink or purple)

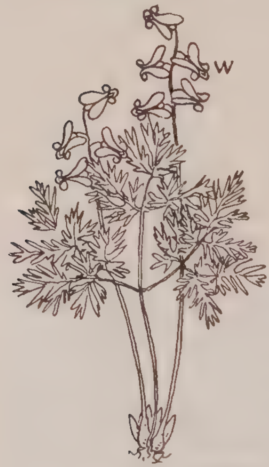
Underneath the small flower-head stands a circle of tiny, green, pointed leaves. These fit closely against each other and form a cup which protects the tiny head while the flowers are in bud.

The leaves of the Milfoil are very pretty. They are very finely cut so as to look like a plume or a very fine fern leaf. They are hairy, and if you crush them they will give a strong and somewhat unpleasant odor. Most of the leaves are near the ground, but there are a few on the upright stem which bears the cluster of flower-heads.

DUTCHMAN'S BREECHES

Bicuculla Cucullaria (Linnæus) Millspaugh = *Dicentra Cucullaria* (Linnæus) Bernhardi

THE Dutchman's Breeches is a common plant that blooms in the spring upon banks, in the woods, and along fences. The flowers are white or cream-colored, and there are usually five or more together on a stalk that comes from the root of the plant. The flowers are very odd.



DUTCHMAN'S BREECHES
(1/3 nat. size) W = white or faintly pink or cream-colored

On the outside are two very small green sepals which are pressed close against the petals. On each side of the two green sepals is a white sac. At the open end of each sac is a lobe by which you can pull the two sacs apart. The edges of the mouths of these white sacs are close together and are covered by the two green sepals, but you can see that they are separate toward the top. Opposite the place where the edges of the two sacs meet are two very narrow white petals. Each petal has a ridge which extends out through the slit made by the meeting of the two sacs. These petals are joined tightly together, and are broader at the top.

If you carefully pull the petals apart you will see the top of the seed-vessel. By looking carefully you may count six stamens, three on one side of the seed-vessel and three on the other side.

The leaves of the Dutchman's Breeches are very pretty. They are gray-green with slender stalks, and are cut up into very narrow parts.

If you dig down to the roots of the plant you will find many little yellow bulb-like bodies from which the plant grows.

Indian Pipe

Monotropa uniflora Linnæus

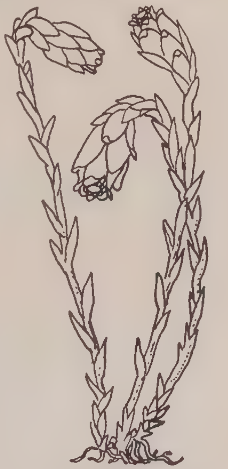
You can never mistake the Indian Pipe, for it is unlike any other plant that you will find. The whole plant, including the flowers and the stem and leaves, is white. It is usually found in the woods near the base of trees.

The single stem rises about six inches above the ground and bends over at the top. At the end is a large, white, nodding flower. Scattered along the stem are several thin, scale-like leaves. These tiny leaves are pointed at the tips and have no stalks. They are almost transparent.

The flower of the Indian Pipe has from two to five white sepals, and inside these are the five white petals with their outer edges slightly spreading. Within the ring of petals are ten stamens with slender stalks. The white stamen-heads split open lengthwise. Down in the flower is the little round seed-vessel with a short stalk rising from the top. The tip of this stalk is divided into five lobes.

When the petals have withered and fallen off, the seed-vessel stands straight up. If you break it open you will find that it is divided into four or five parts inside, and each part is filled with tiny seeds.

When the plant is old it is no longer white and beautiful, but appears black and dried. If you pull it up you will find at the base a mass of tangled fibers.



INDIAN PIPE
(4/9 nat. size) Entire plant white

Pasque Flower

Pulsatilla patens (Linnæus) Mill = *Anemone patens* Linnæus var. *Wolfgangiana* (Besser) Koch

Boys who live in the northwestern part of the country will know the Pasque Flower, for it is found in great numbers on the prairies. It grows so abundantly that it often makes the fields look white with its white blossoms.

Each flower has five, six, or seven purplish-blue to whitish sepals which are ovate in shape, and have numerous veins upon them. On the under side these sepals are tinged with purple.

Inside the petals is a ring of many stamens, and in the center of this ring of stamens is a round head made up of very many tiny green seed-vessels. Each seed-vessel has a long, slender, feather-like tip. When the flower has withered, these feathery tips grow longer and form a ball that looks like cotton.

Each flower grows all alone on a short stalk, and where this stalk is attached to the main stem of the plant there is a very hairy leaf which is cut up into many long, narrow parts. This leaf has no stalk, but those lower down on the plant have stalks. Each leaf is cut up into many narrow parts and is spread out like a hand with fingers. Each of these parts is sometimes again deeply cut. All the leaves and stems are covered with fine, gray hairs.

PASQUE FLOWER (1/3 nat. size)
W = whitish or purplish blue

SHEPHERD'S PURSE

Bursa Bursa-pastoris (Linnæus) Britton = *Capsella Bursa-pastoris* (Linnæus) Medicus

The Shepherd's Purse is a very common little plant, but it is not at all attractive, for it has not the beautiful colors that most flowers have. It is found all summer by roadsides and in waste places. The flowers grow close together on stalks near the top of the stem. They are very small, with tiny white petals. The flowers which grow lowest on the stem open first, and the green buds are in a cluster at the tip.

If you look closely in the center of the flower you will see the tiny yellow

SHEPHERD'S PURSE
(1/3 nat. size) W = white

stamen-heads. Beneath the petals are found the four small green sepals.

After the flower has withered, the seed-vessel, which still clings to the end of the stalk, grows larger. It looks like a small green heart with a hard knot in the center. You will easily recognize the Shepherd's Purse by these seed-vessels, which are far more noticeable than the flowers.

The plant has two kinds of leaves. Those near the ground have short stalks and are arranged in the form of a rosette. These leaves are long and narrow and their edges are deeply cut, nearly to the center vein. The leaves which grow further up the flower-stem are shaped like the head of an arrow, and their bases clasp the stem closely. Both kinds of leaves are usually hairy, and so are quite smooth.

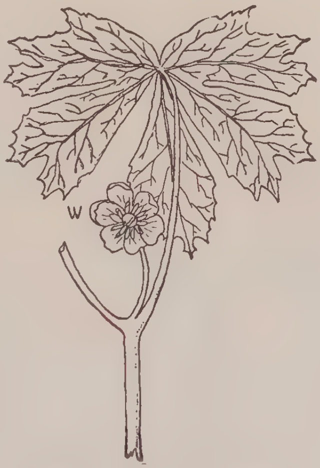
May Apple

Podophyllum peltatum Linnæus

This is one of the wild plants that you can easily learn to know. It grows in the woods and on shady banks and sometimes in open fields. Many plants usually grow near together, their broad leaves almost covering the ground. The leaves are not near the ground, but are often a foot or more above it.

The May Apple leaves are rounded, and the edges are deeply cut, so that each leaf has five or more lobes. Each lobe has toothed edges, and there are many veins upon it.

You may find two kinds of plants. One kind has just one large leaf, with the stout, hollow stalk attached to the middle of the leaf on the under side. This plant bears no flowers. The other kind of plant has the stem forked a little more than halfway up from the ground, and each fork bears a large one-sided leaf. Where the stem forks you will find a large, white, showy flower, placed on a long, slender, curved stalk.



MAY APPLE (2/9 nat. size)
W = white

The flower has six or more large white petals, and each petal is hollowed so that the flower is like a deep saucer. In the center of the flower is the fat green seed-vessel, with a ring of many yellow stamens around it. If you find a flower which has not yet opened you may find six greenish sepals, but these sepals soon fall off when the petals begin to unfold.

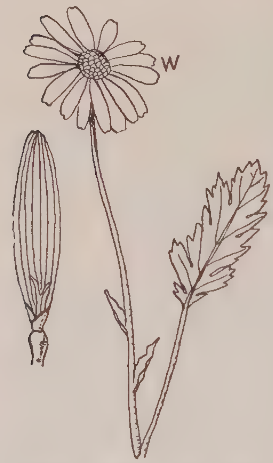
After the flower has withered, the seed-vessel grows into a yellow, fleshy, egg-shaped May Apple, with many seeds inside. It is not really an apple, but is more like a tomato, and it is edible.

FIELD DAISY

Chrysanthemum Leucanthemum Linnæus

YOU will find the flowers of the Field Daisy from summer until late autumn, sometimes making the fields a mass of white. It is a pretty plant, but the farmer calls it a weed because it spreads rapidly in fields and pastures and keeps the grass from growing.

The flower-heads are large and are made up of two kinds of tiny flowers crowded close together. The yellow tube-flowers stand on a flat disk, and outside this disk is a double ring of larger white flowers. Each yellow tube-flower is toothed around the edge and has the tiny stamens joined together forming a little stalk. The white flowers have tiny tubes which spread out into white straps. These straps extend outward and form a beautiful border around the yellow center.



FIELD DAISY (2/5 nat. size)
W = white outside petals with yellow center

One large flower-head grows at the end of each branch of the plant. At the top of the green flower-stalk is a double ring of green, pointed leaves which will be seen as you turn the flower over. When the flowers are in bud the head looks like a thick green button with a yellow spot in the middle, as these small green leaves are tightly folded in a circle around the flat yellow center.

The leaves of the Field Daisy are feather-shaped, with their edges cut up into many blunt points. They usually have no stalks, but spring from the main stem. The stem is tall and stiff and has many ridges running from the top to bottom.

BLOODROOT

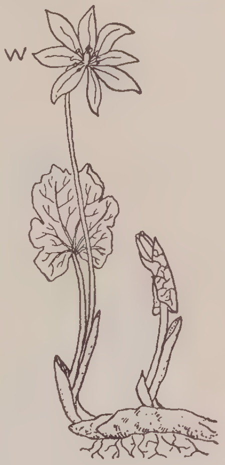
Sanguinaria canadensis Linnæus

ONE of the early spring flowers that you will find in the woods and on sunny banks is the Bloodroot. It is so named because whenever the root-stalk is broken a bright orange-red juice flows out. You may often find large patches of these starry, snow-white flowers with their broad faces looking straight toward you. Each flower has a yellow center.

There are seven or more narrow white petals to each flower. At first they form a cup, but as the flower becomes older they spread out and do not fit closely together. When in full bloom the petals fall off very easily. Each flower has many yellow stamens with short, thread-like stalks, and they dust their yellow pollen upon the pure white petals. In the center of the flower is a single seed-vessel.

The flower is at the end of a long stalk which springs from the ground. If you find a flower which is still young, you will see that it has a leaf fold around it. It is protected in this little house until it is strong enough to unfold. The bud has two green sepals which fold around the white petals, but you will find no sepals on the older flowers, for they have fallen off.

The leaves of the Bloodroot are very pretty as they are folded around the flower-stalk and later as they spread into a rounded blade. Each leaf has many veins and its edges are beautifully cut.



BLOODROOT (1/3 nat. size)
W = snow-white

EARLY SAXIFRAGE

Micranthes virginiensis (Michaux) Small = *Saxifraga virginiensis* Michaux

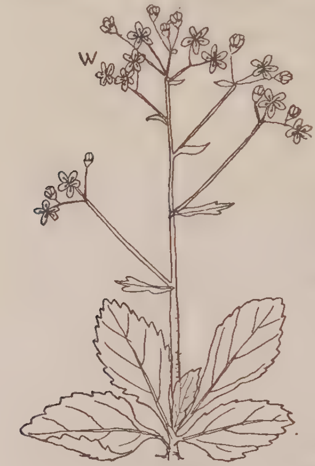
THE Saxifrage grows in dry and rocky woodlands and is sometimes found in the crevices of rocks where there is very little soil. It can grow in these places because it is a small plant and does not need much water.

The flowers are small and white and are in clusters at the top of the plant. When they first appear they are very close together, and in the center of the compact cluster are many little round green buds. As these buds begin to unfold, the cluster spreads out, and you can see that the plant has several tiny branches. Each branch has several white flowers at the end.

There are five narrow white petals to each flower, and the tips of the petals curl back. Looking beneath the petals you will see the green calyx. It is a cup with five teeth at the top.

In the center of the flower you will see several little yellow stamen-heads which are packed tightly in the tube formed by the five white petals. You will not see the seed-vessels until after the petals have fallen off. When the plant is older you may find that there are two tiny pods. These pods often become red later in the spring.

The leaves of the Saxifrage are placed close to the ground in the form of a rosette. Those nearest the center are shorter than those outside. The leaves are rather thick, with toothed edges, and have fine hair scattered over them.



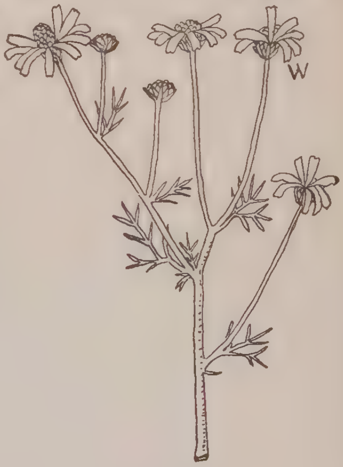
EARLY SAXIFRAGE (½ nat. size)
W = white

MAYWEED

Anthemis Cotula Linnæus

THIS plant may be found in meadows and waste places, and along roadsides, often forming large patches. It is much branched and bushy and often grows close to the ground, but sometimes it is a foot or more high. The stems are tough and quite smooth, with fine ridges running up them.

The flower-heads are made up in the same way as those of the Daisy. You will find the mass of tiny yellow tubes crowded closely together in the center, and forming a border around this yellow center is an outer ring of larger flowers. Each of these larger flowers has a short tube which spreads out into a long white strap. When the flower begins to wither, these white straps droop downward toward the stalks, and the yellow center no longer remains flat but becomes the shape of a thimble. You



MAYWEED (2/5 nat. size)
W = white

may find many of these yellow thimbles on the plant after all the white straps are gone.

There is usually one flower-head at the end of each branch. Below each flower-head is a double ring of small green leaves which fit closely together to form a cup. The tips of these leaves are sometimes tinged with pink.

The leaves of the Mayweed are much divided into very narrow parts. They are somewhat feathery and very beautiful. If you pick one of these leaves and crush it you will find that it has a strong, disagreeable odor.

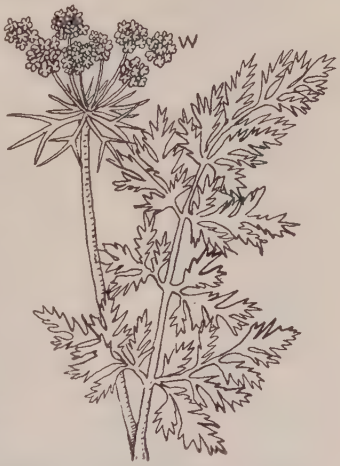
QUEEN ANNE'S LACE

Daucus Carota Linnæus

The Queen Anne's Lace is a very common plant that grows in fields and pastures, in waste places, and along roadsides in most parts of the country. To the farmer it is a weed, and it is often called the Wild Carrot.

The Queen Anne's Lace is a pretty plant, with its many clusters of tiny white flowers. Each cluster is at the end of a long stiff stalk, and there are often twenty-five or more of these stalks attached together at the end of a branch. These stalks stand out like the braces of an umbrella, and are all about the same length. Where they are joined to the end of the branch there are several very narrow, deeply cut leaves with tapering tips.

Each flower is very small. There are five white petals, but they are not all the same size. One is much larger than the other. The tips of the petals are folded over, and are sometimes tinged with pink. There are five stamens, each of which stands between two petals, and in the center of the flower are two thread-like branches which are attached to the seed-vessel. The flower has no sepals.



QUEEN ANNE'S LACE (4/9 nat. size)
W = white

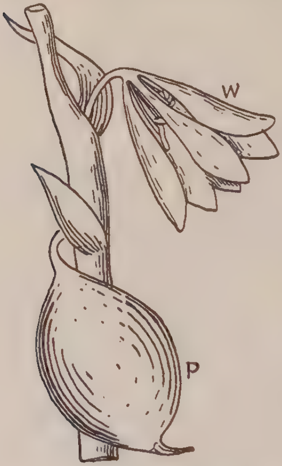
The seed-vessel is beneath the petals, and has ridges upon it. When it grows to its full size the ridges are covered with tiny prickles. These prickles stick tightly to your clothing, and help to scatter the seeds. When the flowers have all withered, the clusters on the outside fold over toward the center, and all together form a little cup which looks somewhat like a bird's nest.

The leaves of the Queen Anne's Lace are cut up into many very narrow parts. There are many leaves close to the ground and they are covered with hairs.

SPANISH BAYONET

Yucca sp.

IN the Western and Southern States, growing on the dry, sandy plains and fields, is found the Spanish Bayonet. It is probably so named because of the shape of its leaves. They are very long and narrow, and the tip of each is a stout round point. The leaves are rather thick, and along the edges are long threads which seem to be split off from the leaf. Sometimes the leaves are near the ground and sometimes they are scattered on the stem. The stem is often covered with dead leaves which have folded downward.



SPANISH BAYONET (1/3 nat. size)
W = white; P = dark purple

The flowers of the Spanish Bayonet are very large, sometimes five inches broad. Each has six white perianth-segments which are very narrow at the base, so that as you look at the side of the flower you can see the stamens and the seed-vessel within. The perianth-segments are usually broad toward the middle and pointed at the tips. Each flower has six stamens, and the stamen-stalks are three or four times longer than the stamen-heads. Inside the ring of stamens is the green seed-vessel.

There are usually several of these white flowers at the top of each plant. Each flower has a slender stalk and often hangs down like a bell. Where the flower-stalk is attached to the stem there is a small green leaf.

After the flower has withered, the seed-vessel grows into a large fleshy fruit which is shaped somewhat like a lemon, but is dark purple and smooth. This fruit has a long, slender stalk at its tip. If you cut the fruit open you will see that it has three thin walls which separate it into three parts. There are several seeds in each part.

Shooting Star

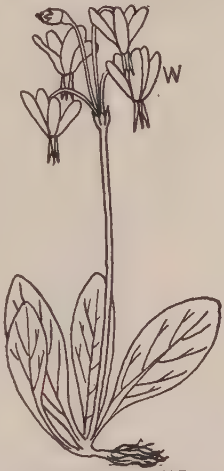
Dodecatheon Meadia Linnæus

This very pretty white or rose-colored flower is very common on the cliffs, in the open woods, and on the prairies in the western and southern parts of the country.

There are many flowers in a cluster at the top of a single stem which has no leaves. All the leaves are at the bottom of the plant, and they form a rosette which nearly covers the ground. Some of the outer leaves taper into long stalks, but those in the center of the rosette have no stalks. The edges of the leaves are sometimes rolled under.

Each flower has five long, narrow petals. These white or rose-colored petals are joined together at the base so as to form a short tube. The edges of the petals are rolled under. Inside the ring of petals are five stamens, each having a short stalk. The stamen-heads are long and narrow and they grow together, forming a slender cone. These stamen-heads are yellow, tinted with purple at the base. Below the petals is the green calyx, made up of five pointed sepals united at the base.

When the flower has withered and the petals have fallen off, the seed-vessel grows into a small pod. If you break this pod open you will find many seeds inside.



SHOOTING STAR
(1/4 nat. size) W = white, purple, or rose-colored

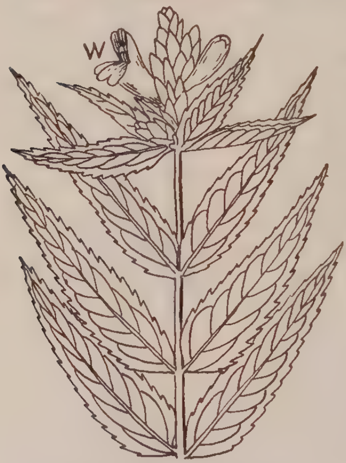
Turtle-head

Chelone glabra Linnæus

This plant is called the Turtle-head because the flower resembles the head of a turtle in shape. It is commonly found in swampy places and along streams in the woods.

The flowers are white or sometimes faintly pink, and several are clustered together at the top of the plant. Only two or three flowers open at the same time. It is just before the flowers open that they resemble a turtle's head.

The corolla is a broad tube with two lips at the opening. The upper lip is somewhat folded and is notched in the middle. The lower lip is broader than the upper one and has three small, rounded lobes. As you look into the mouth of the flower you will see a tuft of wool. This is really the cluster of stamens, for both the stamens and the lower lip of the corolla are woolly.



TURTLE-HEAD (2/5 nat. size)
W = white or faintly pink

Just above the tuft of stamen-heads you will see a long, slender, green thread which is the top of the seed-vessel. The seed-vessel itself you will find at the bottom of the corolla-tube. The buds and flowers are placed very close together, but you will see that each flower has five sepals. Below the sepals are a few small green leaves.

The leaves of the Turtle-head are opposite each other on the stem and are in pairs. Each leaf is long and tapering at the tip, and rounded at the base. The edges are toothed. The stem of the plant has four sides and grows about two feet high.

Spring Beauty

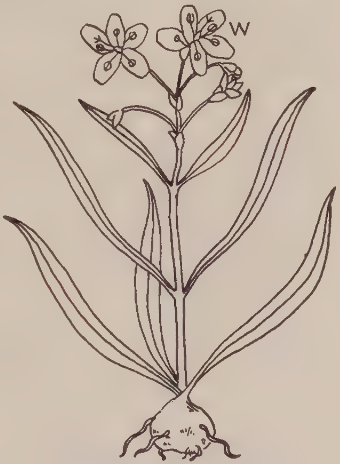
Claytonia virginica Linnæus

The Spring Beauty is well-named, for it is one of the very pretty flowers that bloom early in the spring. It is a flower that all children love, because it comes so early and because it grows so abundantly. Sometimes the Spring Beauty plants grow in large patches, but often you may find only a few together growing on banks and around the bases of trees. Each plant usually has several flowers, but they do not all open at the same time.

Each flower has five white or pink petals with many branching darker pink veins running toward the center of the flower. The petals are broader toward the outer edges. At the bases of the petals are tiny sacks which are filled with nectar. You may not see them, but the bees know that they are there. Perhaps the dark pink veins which run toward the center of the flower guide the bees to the nectar sacks. In the center of the flower are the five stamens with their yellow heads, and inside the ring of stamens is the seed-vessel. Below the petals are two green, boat-shaped sepals.

Each flower has a slender stalk which is curved before the petals unfold, but as the flower opens the stalk straightens and raises the dainty blossom up to get the sunshine. After the flower withers the slender stalk droops again, and the seed-vessel, tightly inclosed in the two sepals, hangs downward just as the bud did.

The Spring Beauty has two long narrow leaves with smooth edges. They are rather thick and grow opposite each other on the stem, just above the ground.



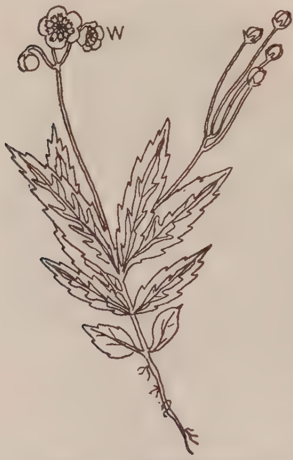
SPRING BEAUTY (4/9 nat. size)
W = white or pink, with darker pink veins

Spotted Wintergreen

Chimaphila maculata (Linnæus)
Pursh

When you come to read about flowers in different books, as you will some day, and study those you see in the woods, you will find several kinds of plants that many people call Wintergreen. You must study all these carefully, if you can get them, so as not to mix them up. The plant called Shinleaf is also called Wintergreen; but we will not notice that yet. Some call the Round-leaved Pyrola the Bog Wintergreen, and it, too, is in the Wintergreen family, or the Pyrolas. Here you will also find the lovely little plant called Prince's Pine, or Pipsissiwa, but hardly anyone calls that a Wintergreen, although it looks a good deal like the plant we will now describe. This is the Spotted Wintergreen; and after you have once got it in your mind and know what it looks like, you will never forget it. It is found only in some parts of the eastern half of the country, while the Prince's Pine is found all over the United States; and, although these plants look a good deal alike, if you observe them closely you will have no trouble in telling them apart. In the Prince's Pine the leaves are not spotted; their ends are broad, and they usually form two whorls of five leaves each on the delicate, straight, slender brown stem of the plant. It has more flowers than the Spotted Wintergreen, but these look a good deal alike in the two plants. So much for the Prince's Pine.

Now, the most likely place in which to find the Spotted Wintergreen is in high, dry woods, where from two to three dozen of these truly beautiful little plants may be seen growing around some big pine tree, or oak, or poplar. Its dark green leaves, pointed at both ends and toothed, are marked with white along the lines of the veins. These leaves are green all winter; and as the plant may grow to be from three to nine inches high, you may easily find them when the snow lightly covers the ground. It has a delicate, straight, slender stem which does not branch until it gets near the upper end, where you will notice that it has from one to five short stems, each curving backward. At the ends of these, in July and August, you will find its dainty little white flowers. Each of them has fine, rather round, creamy-white petals, sometimes pinkish, with green centers surrounded by yellow; they are delightfully fragrant. After the flowers are gone, the stems turn very dark, as do the round little seed-pods at their ends. These you will often notice sticking up above the snow in the winter, and by digging down you will find the very shiny, dark-green, spotted leaves; but the long, running roots will be hard to pull out of the frozen ground.



SPOTTED WINTERGREEN
(1/3 nat. size) W = white

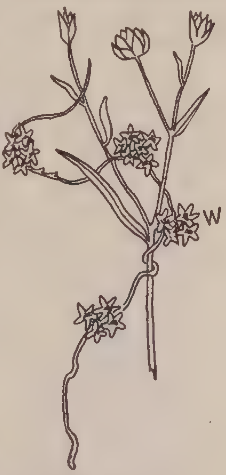
Dodder

Cuscuta sp.

In our Common Dodder you have a very curious plant to study, and one quite different from such plants as have leaves, roots, and showy flowers; and the reason it is also called Strangle Weed and Love Vine you will soon see. The best time to find Dodder is in its flowering season, from July to early fall, when you will be pretty sure to meet with it along the borders of marshes, in swamps and wet meadows, and by drains, ditches, and streams. Here, among the thick masses of blackberry briers, touch-me-not or jewel-weed, sunflowers, and elderberry bushes, you will come across a curious, long, and slender vine. It seems to be twisted in all kinds of ways tightly about the stems of the plants like wiry, yellow yarn. Really it seems to be choking to death the pretty plants, as it hangs in festoons from them wherever you look. There is no use to look for its leaves or its roots, for it has neither the one nor the other. All you can see is the yellow, string-like vine, twisted so tightly about its neighbors that it is hard to pull it off. Pretty soon you come across its flowers, and you find them in crowded little bunches springing from the vines in great numbers.

Some of these curious vines are of a bright orange instead of yellow, and so showy that they will catch your eye just so soon as you come to the place. You try to tear a piece of the vine away, and you find that it breaks to pieces before it will give up its hold. The secret is this: Dodder, like all true plants, started from seed, sprouted and grew like other little vines; and, winding around the plants next to it, it twisted about those it liked best, and then stuck to them by its tiny suckers everywhere. With these it sucked the juice or sap of the plant it was strangling and living upon. So well and fully did it do this that its roots soon were of no use and disappeared entirely in time. Neither has it any use for leaves, for the shade of the thicket where it lives is enough for it; indeed, everything it needs is gained by robbing its neighbors wherever it grows.

It is not hard to find all this out if you examine a piece of the vine very carefully, though often its suckers are deep in the bark of the plant from which it takes the juices upon which it lives. Some people call this the Love Vine; but you will surely think this is too good a name for such a robber. Others call it "Angels' Hair," but why, it is hard to tell. If you study one of the little flowers of the Dodder with your magnifying glass, you will see that the bell-shaped corolla has five lobes. There are five stamens, and the calyx below is also five-parted.



DODDER (4/9 nat. size)
W = yellowish white

Dodder belongs with such vines as the common Bindweeds and the Morning Glory; but these, as you well know, do not suck the juices of other plants.

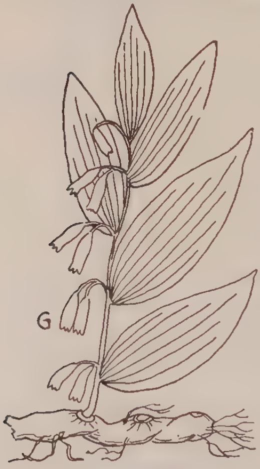
You will find there are more than a dozen kinds of Dodder; but they are not so very different, and they all live the same way.

GREAT SOLOMON'S SEAL

Polygonatum commutatum (Roemer & Schultes) Dietrich

THERE are a great many plants in the Lily Family that you are already familiar with, such as onions, various kinds of lilies, asparagus, and the rest. Now, Solomon's Seal also belongs in that family, and there are but few plants in the woods that you are likely to confuse it with, though poor observers sometimes mistake it for one of the three kinds of False Solomon's Seal, but certainly not with its relative, the Twisted Stalk.

Solomon's Seal is generally found growing on wooded hillsides and occasionally in thickets. Where it occurs in plenty, you should have no trouble in finding a plant in flower any time during April up to and including midsummer. You will know it almost at once by its long and smooth green stem, which has the leaves arranged alternately the whole length of it; these become smaller and smaller as you follow them toward the end. They each clasp the stem and are pointed, of an oblong-ovate form, being of a light-green color, paler underneath. Sometimes you will find these leaves finely hairy, and the veins run as they do in the Lily-of-the-Valley and similar plants. Hanging by delicate little stems, you will find a pair of beautiful small flowers dangling from the stem where each leaf is attached. Once in a while you will find that there may be three of these flowers, but not often; when it happens they occur on the near end of the stem. Each flower is of a cylindrical form, somewhat bell-shaped near its free edge, and of a yellowish color, frequently tinged with green. They each have six stamens and one pistil, and the plant is an extremely attractive and graceful one withal.



GREAT SOLOMON'S SEAL
(4/9 nat. size) G = yellowish, tinged with green

Coming, next, to its root: you will find it to be a pretty big one, many-jointed, and thick. As the plants wither and die from year to year, each leaves a scar on this root-stock, which, as the story goes, resembles some sort of a seal; hence the name of the plant. By counting these scars you may tell the age of the plant. When summer is pretty well along, the flowers are followed by little round, green berries, which afterward turn bluish-black; and, of course, each swings on its little stem as the flowers did before them. Late in the autumn the leaves of Solomon's

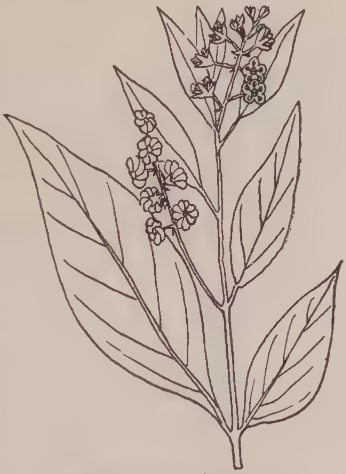
Seal turn a very beautiful tan color; and should its double row of black berries still be suspended from beneath the stem, you certainly have before you a very handsome, not to say decorative, plant. A few of them are well worthy of being placed in a vase at home, where they will hold their leaves and berries for quite a while, and be an added attraction to a bunch of autumn flowers.

Poke Weed

Phytolacca americana Linnæus = *Phytolacca decandra* Linnæus

One of the best places for you to find Poke Weed growing is where the woods have been burned over by fire; but you will also find it by the fences along the roads in the country. Maybe, too, in other places, but not nearly so often. You cannot miss it, for it may grow to be ten feet high. It has a stout, branching stem, which is pithy inside; the leaves are narrow and pointed at both ends, and the small flowers, in bunches and with no corollas, do not specially catch your eye in the summertime. You will notice them more, however, when their places are taken by the rather large green berries, and when nearly all the parts of the plant begin to turn a bright red late in the summer. The long clusters of berries are then a very dark red and very juicy. You will see the robins, cat-birds brown-thrashers, and other birds feeding upon them, while some people get the berries to make a red ink with; others gather and eat the tender shoots in the spring after boiling them. You should know that the root is poisonous and never ought to be eaten by any one.

Some plants, or nearly all plants, have, you know, several names, and this is true of our Poke Weed. Some people call it "scoke," but why, it is hard to tell. Long ago it was called "pigeon berry," because the wild pigeons came in hundreds to eat its fine, juicy berries or fruit. But our beautiful wild pigeons are now all gone, and so the best name for it is, after all, the Poke Berry.



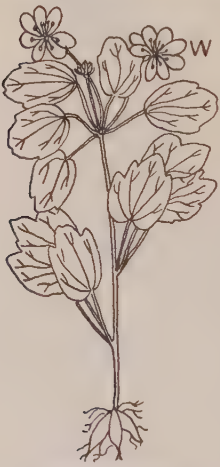
POKE WEED (4/9 nat. size)

Do you ever wonder why the Poke Berry is nearly all red when its berries are ripe at the end of the summer—stems, leaves, berries, and all? It is a good thing to know for it will make you ask questions like it about other plants. Now, a big bush, such as a Poke Berry, when bright red in the early fall can be seen much more easily by the birds than a green one; and when it is red the birds know that its fine, juicy berries are ripe and ready to eat. Many birds flock to the Poke Berry bushes to feed on the berries, of which they are so fond. When they have eaten all they can, these birds fly away to many different places; and if you could find their droppings, you would be sure to find Poke Berry seeds in them. These seeds are pretty sure to sprout, and Poke Berry bushes grow up from them; and so it happens that more plants of the kind grow up in a great many places.

RUE ANEMONE

Syndesmon thalictroides (L.) Hoffmansegg = *Anemonella thalictroides* (Linnæus) Spach

YOU will be sure to be interested in the Anemones, especially the Wind Flower or Wood Anemone, and the species here to be described, that is, our typical little American forest flower, the Rue Anemone. In the woods there are still other Anemones, as the Long-fruited Anemone and the Thimble-weed, which latter is the tall Summer Anemone; but these are so different, and so lacking in the delicate structure and historic interest of the Rue and Wood species, that we can well afford to pass them by at this time.



RUE ANEMONE
(1/3 nat. size) W = white

Poets and romance writers have passed along to us many a pretty verse and many a pretty story on the Anemones of Europe. But this is a long, long story; and if you love flowers, the time will come when you will meet with it all in your reading. Our own Rue Anemone is a great favorite, and for not a few reasons, you may be sure. It is a flower of the woodlands and hillsides, where big tulip trees, oaks, chestnuts, beeches, and hickories stand well apart, and the ground all around is dark and rich. Here the raw, blustering winds of March sweep the masses of dead leaves into the gullies or among the rocks and old logs, where they mat together and refuse to be driven any further.

Yonder, in that bare space, at the foot of the big oak tree there, you spy eight or ten delicate little plants scattered about, bearing the prettiest little white flowers one can well imagine. They bob and nod in every breeze that comes along, and are only still when no air is at all stirring. You may be sure that these are Rue Anemones, for you would never take them for Bloodroots, and it is too early for the Wind Flowers, or, as they are called, Wood Anemones, to be above ground yet, although, in some places, the Rue and the Wood Anemones bloom together. However, the season is then much further along—in fact, into late April or early May. It is quite easy to tell them apart; for in the Wood Anemone the flower is always single on top of the frail stem, while in the Rue they are in clusters of two or three to each plant. Its long-stemmed, dark-green leaves remind you of those of the Meadow Rue; but the flowers are very different.

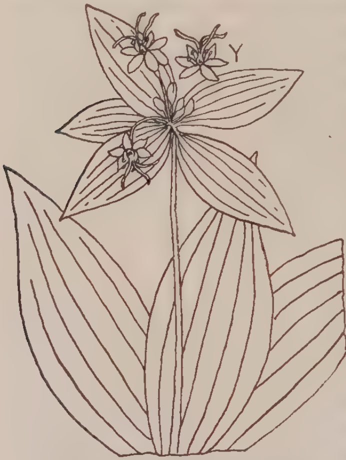
In the Rue Anemone they are white, and in rare cases tinged with pinkish-magenta. It has no petals, while the five or ten sepals are, as has been said, white and very conspicuous. The flower has also numerous stamens, and from four to fifteen pistils. Sometimes you may meet with a plant fully a foot high; but as a rule they are rarely over six inches. If you pluck them they droop and wither almost immediately; so the only way to get them home is to take a few plants up, roots and all. You will then note that their roots consist of a bunch of little tubers, like a dahlia's, only many times smaller. The roots of the Windflower are quite different, which you will soon see by comparing them.

Indian Cucumber-root

Medeola virginiana Linnæus

Indian Cucumber-root is a plant that, when you once know it, you will never forget, and you will be able to name it as soon as it catches your eye in the rich, damp woods where it grows. Sometimes, though, it manages to get away from the low, marshy places and thickets, and you will find the plant growing higher up on the hillsides. It has been given a place in the Lily Family, where you will find a whole lot of other plants, not a few of which are already known to you, as the Wild Onion, the Day Lily, Asparagus, and the Common Green Brier.

This Indian Cucumber-root has a straight, slender, and wiry stem that may be three feet in height, but usually not more than two, or even less. Near its middle there is a circle or whorl of light green leaves, running from five to nine in number; they are pointed, tapering at both ends, and veined like the leaf of the Lily-of-the-Valley. At the very top of the stem you will note three other leaves, which are more pointed, much smaller, and broader. Above these, in the spring, grow the three flowers. Each is on a curved and slender little stem, so slender that the flowers nod when blown by the wind; they are of a greenish-yellow color. There are six stamens of a terra-cotta-brown shade, and the three stigmas are of the same color.



INDIAN CUCUMBER-ROOT
(4/9 nat. size) Y = greenish-yellow

You will note that the sepals, the three petals, and the three divisions at the end of the pistil are all recurved—that is, curved backward. Such a pretty plant as this is sure to catch your eye as you go through the place where it grows in the spring. Still more certain, though, will you be to notice it when September comes round; for then the flowers are replaced by the plant's fruit—that is, by three round, blackish-purple little berries, and the leaves have become much varied in color, often being bright yellow and mottled; the three upper leaves are sometimes dashed with crimson-red. Its berries are frequently eaten by birds, and this, as you know, makes sure of the plant springing up in other places, often at great distances from the parent one.

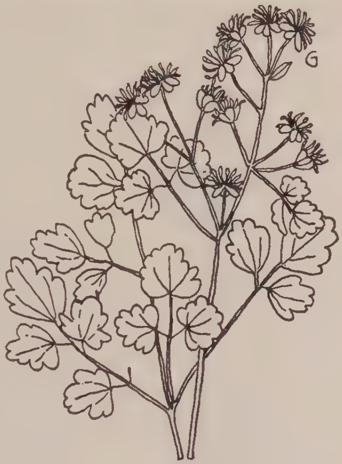
The root is shaped like a long, pointed cone, with little fibers springing from it in a few scattered places. These, you will note, are short and wiry, and the root as a whole is at right angles to the stem. Should you chew a piece of the root, you will surely say that it tasted like a raw cucumber. It is said the early Indians in some parts of the country used to gather and eat them, and so it has been given the name it now has—that is, Indian Cucumber-root.

EARLY MEADOW RUE

Thalictrum dioicum Linnæus

THIS lovely plant grows in open, rocky woods over the greater part of the United States, and it blooms about the middle of spring, or even as early as April. It is easy to find, for when in flower it may come to be at least two feet tall. Its masses of little greenish-white blossoms are out in such plenty on the plant that you can see it quite a ways off. These are the pistillate ones; while the staminate ones, on separate plants, always are different, being set in four small, greenish sepals; the stamens —rather long and slender—are of a reddish tan and purplish in color. It secretes no nectar, and few insects, therefore, come to it; and were it not for the wind, the pollen would have but little chance of falling on the female flowers. You will see that this pollen is there in plenty on the male flowers; and should you jar an Early Meadow Rue with your hand, after its many flowers are in full bloom, you will see what a shower there is of it.

After all, perhaps some insects do help in passing the pollen along; but Early Meadow Rue does not depend upon them much for aid in preventing the plant from dying out and disappearing, in time, altogether, which, as you know, would happen were the pollen unable to reach the female flowers. Should you know the Maidenhair Fern when you see it in the woods, the leaves of this Early Meadow Rue will surely remind you of it, only they are not so dark. They are olive green in color, with a bluish tinge to them and dull; and they are compounded—that is, there is a main stem, with other opposite, branching, stems, and each of the last has from three to five leaves on it. They are loosely spreading on the plant and the handsomest part of it—even prettier than the tiny, greenish flowers themselves.



EARLY MEADOW RUE (1/3 nat. size)
G = greenish-white

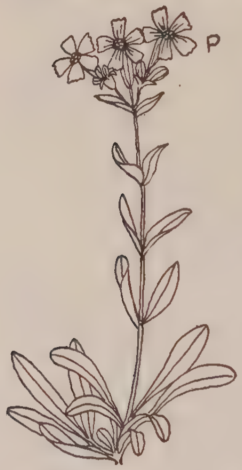
Early Meadow Rue belongs in the Crowfoot Family, where, too, we find upward of a dozen other kinds of Meadow Rue, among them the Tall Meadow Rue, which you will find so common sometimes along streams in marshy meadows. The lovely Anemones and Clematis are also in this Crowfoot Family, as are the Buttercups, Bugbanes, Hepatica, Columbine, Larkspur, Aconite, Cohosh, and many other familiar plants, and you already know some of these.

PINK FLOWERS

Wild Pink

Silene caroliniana Walter = *Silene pennsylvanica* Michaux

The Wild Pink, with its beautiful bright flowers, is found very commonly in rocky woods in the springtime. The plant spreads out on the ground and often forms a small mat. There are usually several flowers growing together at the end of each branch, but only one or two unfold at the same time.



WILD PINK (4/15 nat. size)
P = pink

Each flower has five bright pink petals which spread flat out. They are rounded at the tips and are sometimes notched. Between the petals you may see five small green points. These are the teeth of the Calyx. As you look closely at the calyx you will see that it is a green tube with many coarse veins running up and down side by side. The petals are not attached near the top of the calyx as in many flowers, but if you split the calyx-tube open you will see that the petals are very narrow at the bottom and that they are attached to a slender green stalk which extends up into the middle of the calyx-tube.

You may not see the stamens until you have pulled off the petals of the flower. The yellow stamen-heads are very small and are attached to slender stalks. In the very center of the flower is the long seed-vessel. It is just above the place where the petals and stamens are attached.

The leaves of the Wild Pink are arranged in pairs on opposite sides of the stem. Their edges are smooth. The plant is covered with tiny sticky hairs.

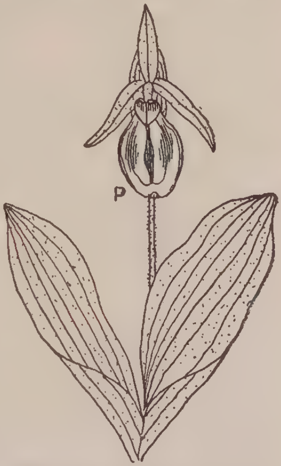
PINK MOCCASIN FLOWER

Fissipes acaulis (Aiton) Small = *Cypripedium acaule* Aiton

THIS is not a very common plant, but if you look carefully you may find it growing in sandy places and in the open woods. It is one of the most interesting flowers that we have. It is sometimes called the Lady's Slipper, because one part of the flower is shaped like a slipper.

This pink slipper is one of the petals which has become much swollen and enlarged. It has an opening upon the upper side, and if you look inside you will see that it has beautiful darker colored veins upon its inner surface. Near the place where the slipper is joined to the rest of the flower are many long white hairs. A tiny flap or shield covers the place where the slipper-petal is attached, and if you lift up this flap you will find a white sticky knob. On each side of the stalk of this white knob is a little yellow ball, and these yellow balls are the anthers. Besides the slipper-like petal there are two other narrow-pointed pink petals, one on each side. The flower apparently has only two sepals and one of them looks very much like the narrow petals. The other is boat-shaped, and the slipper-petal rests in it. This latter is really two sepals united.

The seed-vessel is outside the flower just beneath the place where the petals and sepals are attached. There is a small green leaf which sometimes folds around the hairy seed-vessel. There are two broad ovate leaves at the base of the plant, with grayish hairs upon them. The leaves have long veins which run from the base to the tip.

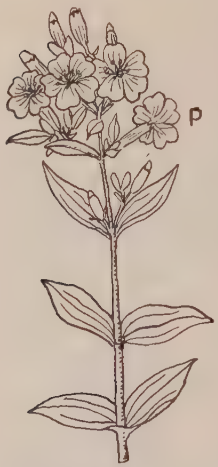


PINK MOCCASIN FLOWER
(1/3 nat. size) P = pink with white veins

BOUNCING BET

Saponaria officinalis Linnæus

YOU will find the Bouncing Bet growing by roadsides and in waste places. It is a very common plant and usually grows in patches. You may often see it covered with dust and then it is not very attractive. But the flowers are really very pretty and many grow together at the top of the stem. Not all the buds unfold at the same time, and it is often several weeks from the time that the first flower opens until the last one disappears.



BOUNCING BET
(1/3 nat. size) P = pink or whitish

Each flower has five pink petals. These petals are broad at their outer edges and are very long and narrow at their bases, just as those of the wild pink are. If you examine one of the petals closely you will find a tiny scale upon it just where it becomes so much narrower. The calyx of the flower is a narrow green tube with five pointed teeth at the top. The lower parts of the petals are hidden in this tube.

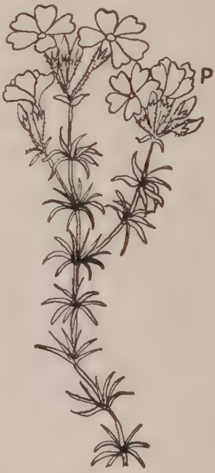
The flower has a ring of stamens, and in the center stands the slender column which is the top of the seed-vessel. At the top of this slender column there are two coiled threads which are covered with fine hairs. When the seed-vessel is well formed the calyx-tube becomes much larger, and if you hold the upper end tightly between your thumb and finger and press the tube it will burst open with a noise.

The Bouncing Bet belongs to the Pink Family, and so has smooth-edged leaves arranged in pairs. The leaves are pointed at the tips. When the stem or leaves are broken you can see that they contain a watery juice. This juice has a bitter taste and makes a lather with water.

Moss Pink

Phlox subulata Linnæus

The Moss Pink is a very pretty plant which grows close to the ground and creeps over the rocks and stony places where it is planted in yards and flower-gardens. It forms large patches, and when the flowers bloom in the spring they almost hide the leaves and form a beautiful mass of rose-purple pink or white. The plant grows wild in some hilly or mountainous places.



MOSS PINK
(2/5 nat. size) P=pink, rose-purple, or white

The flower does not belong to the Pink Family, but gets its name because it looks somewhat like the Wild Pink. There are five petals, each having a broad notch on the outer edge. These petals lie flat open just as do those of the Wild Pink. If you try to pull off one of the petals you will see that it is not like those of the Wild Pink, for the petals of the Moss Pink are joined together at the bottom and form a long slender tube like those of the Phlox. Upon each petal, near the place where it joins the others, are sometimes two darker-colored spots which look like tiny eyes.

There are five short stamens attached to the corolla-tube just as in the flowers of the Phlox, for the Moss Pink is a kind of Phlox. The sepals are united to form a green calyx-tube in which the corolla-tube is placed.

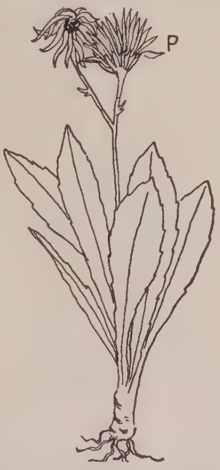
The stem of the Moss Pink is very leafy and much branched, and the flower-clusters are at the ends of the branches. Each flower has a short stalk. The leaves are long and narrow, with smooth edges. They are placed opposite each other on the stem, but near the ground many are often clustered together.

FLEABANE

Erigeron sp.

THE Fleabane is another member of the large Composite Family. It grows in fields and waste places and is common from spring until autumn.

The flowers look like white or pink daisies. Each flower-head has a ring of narrow pink or white straps on the outside which lie flat out when the flower is unfolded. In the center of this ring of strap-shaped flowers are very small yellow tubes. Each tiny tube-flower has five teeth on its edge, and if you look down inside the tube while the flower is young you will see the tiny stamens joined closely together to form a green or yellow stalk. If you pull the flowers out of the head you will find the seed-vessels at the bottom of the tubes, and a ring of white hairs where each tube joins the seed-vessel. When the flower is older and the corolla has withered, these hairs become longer and help the seed to be carried away by the wind.



FLEABANE (1/2 nat. size)
P = pink or white

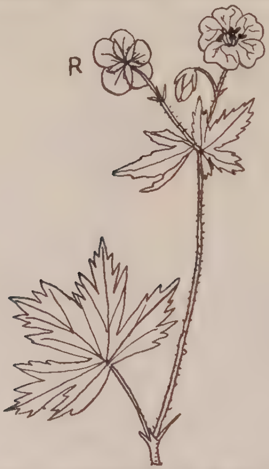
When all the flowers have fallen from the head there remains a shallow green cup and inside the cup is a white disk covered with tiny pits. The cup is made up of many small green leaves.

There are several heads on each Fleabane plant, and each head has a slender stalk. Where each stalk is attached to the stem there is a narrow leaf. Some leaves of the Fleabane have toothed edges, and others have nearly smooth edges. There are usually hairs scattered over the stem and leaves.

WILD GERANIUM

Geranium maculatum Linnæus

THE Wild Geranium is one of our most beautiful wild flowers. In the late spring it often covers the wooded fields with its delicate pink or lavender blossoms. It is related to the geranium which is cultivated in gardens as a house-plant.



WILD GERANIUM (1/3 nat. size)
R = rose-purple

The flower has five large, thin petals. The outer edge of each petal is notched, and there are darker-colored veins running from the base to the outer edge. There is a circle of green sepals below the petals, and they are much smaller than the petals. Forming a ring in the center of the flower are ten stamens with slender stalks, and within the ring of stamens is the green seed-vessel.

The petals soon wither and fall off, and the long spike of the seed-vessel, with a small star at the end, can be seen extending out from among the sepals. This spike has five seeds clustered around its base, and when the seeds are ripe the spike splits into five thin strips. Each of these strips curls up to the top, carrying a seed with it. Then the seeds are blown away from the curled strips by the wind.

The flowers of the Wild Geranium grow few together toward the top of the plant. Each flower has a slender stalk of its own.

The leaves are very pretty. Each is shaped like a hand with the fingers spread out. These five parts or fingers are deeply notched all around the edges. Some leaves grow from near the ground and have long stalks, while those higher up on the plant have very short stalks. Both the stem and the leaves are covered with long white hairs.

The Herb Robert is closely related to the Wild Geranium, but it is smaller and it has more finely divided leaves.

COMMON MALLOW

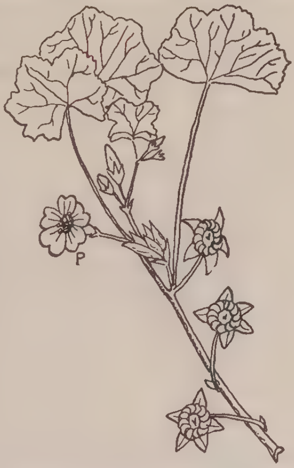
Malva rotundifolia Linnæus

THE Common Mallow is a spreading plant which grows close to the ground and may be found by roadsides and in waste places throughout the summer and autumn. It is often called a weed.

The flowers are rather small and grow singly at the ends of tiny stalks. The five petals are beautiful pale pink or purple with darker-colored veins. Each petal is narrow at the base, and the edges do not meet closely where the petals are attached. A part of the green calyx can be seen between the petals. The upper part of the petal is broader and there is a notch in the outer edge.

In the center of the flower stands a small purple pillar formed by the slender stalks of the stamens, joined together. The stamen-heads are clustered at the top and the wavy points of the seed-vessel rise among them. After the petals have fallen off, the seed-vessel grows and becomes like a little green button. These flattened seed-vessels are sometimes eaten and are called cheeses.

The calyx of the Mallow is made up of five green sepals with pointed tips and hairy edges. The sepals are united at the base. Just below the calyx are three narrow leaves which you may mistake for sepals.



COMMON MALLOW (1/2 nat. size)
P = Pale Pink

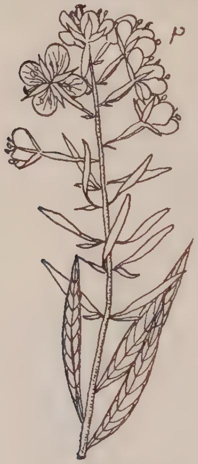
The Mallow has pretty, rounded, dark-green leaves with wavy edges. Each leaf has a short stalk. If you pull up the plant you will find that it has a long straight root like a carrot running down into the ground, with several tiny white roots attached to it.

FIREWEED

Chamaenerion angustifolium (Linnæus) Scop. = *Epilobium angustifolium* Linnæus

THIS plant is found abundantly in fields, especially in places that have been newly cleared and burned over. For this reason it is called the Fireweed. It is a tall, slender plant, often higher than your head, and is usually branched at the top.

The Fireweed has rather small purple or pale-pink flowers with four petals, each of which has a V-shaped notch in its outer edge. At the back of the flower are four narrow, pointed, green sepals which lie close to the petals. Within the flower are eight stamens with tiny yellow heads. Among these stamens you can see the slender pillar which rises from the seed-vessel. At the top this pillar is divided into four yellow rays. The seed-vessel itself is below the sepals. It is a long, narrow pod, and looks much like a slender red or green stalk.



FIREWEED
(1/3 nat. size)
P = purple or pale pink

The flowers grow in clusters near the top of the stem, and those lowest down open first. As the stem grows longer, those nearer the top unfold, while the ones below wither. When the petals and the green calyx fall off, the seed-pod grows larger, and as soon as the seeds inside are ripe it splits open into four strips. Each strip is lined with a row of small, brown, hairy seeds.

The leaves of the Fireweed are oval with pointed tips and sharply toothed edges. The stem of the plant is quite smooth, and is red on the side that gets the most sunshine.

HEDGE BINDWEED

Convolvulus sepium Linnæus

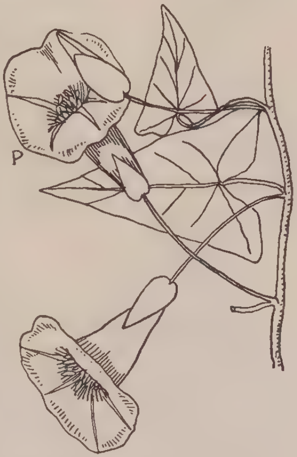
THE Bindweed may be found in meadows, fields, and waste places, twining around other plants or trailing on the ground. It blooms all summer and may easily be known by its large, pale pink or white flowers. The plant is closely related to the Morning Glory.

Each of these flowers has a narrow tube which fits into the small green calyx-cup, but at the mouth it spreads out into a beautiful bell. The edges of the bell are gracefully waved all around. Inside the bell are curious markings like rays which extend from the edge of the flower to the bottom of the tube.

Within the corolla you will see the five yellow stamen-heads, each at the top of a short stalk. In the center of the flower is the slender green stalk which comes from the seed-vessel with a round white head at the tip.

You should notice how wonderfully the corolla-tube is folded when the flower of the Bind-weed is in bud. If you observe a bud one day, the next day you will find it has unfolded and spread out like a bell, while on the third day you will find it withered and almost ready to fall off.

The stem of the Bindweed is twisted like a piece of rope. It clings to any stronger plant, and twines around and around the plant, until it sometimes nearly chokes it. The leaves are shaped like the head of an arrow and have smooth edges. Each leaf has a short stalk of its own.



HEDGE BINDWEED (1/3 nat. size)
P = pale pink or white

Trailing Arbutus

Epigæa repens Linnæus

The Trailing Arbutus is a favorite flower of early spring because it is so fragrant, and because the blossoms do not wither for so long after they are gathered. The plant often grows in large patches in sandy or rocky woods, especially under evergreen trees.

The flowers are pink, and several of them grow in a cluster at the end of the stem. The corolla is a small tube with five rounded, spreading lobes at the top. As you look into the tube you will see that it is somewhat hairy, and if you spread it open you will find tiny pink lines running nearly to the base. Each flower has ten stamens, and by looking closely you may see that each stamen-head has two small openings. The yellow pollen dust comes out through these openings. At the back of the flower, outside the corolla-tube, are five small, pointed, green sepals.

TRAILING ARBUTUS
(2/5 nat. size) W = pale pink or white

If you pull off the corolla-tube, and with it the stamens, which are attached to it, you will see the hairy seed-vessel standing among the green sepals.

The leaves of the Trailing Arbutus are thick and remain green throughout the winter. They have smooth edges and are rounded at the outer end, with a very short point at the tip. Each leaf has a short, hairy stalk. The stem of the plant grows from ten to fifteen inches long, and creeps along the ground. It is covered with short brown hairs.

SPREADING DOGBANE

Apocynum androsæmifolium Linnæus

THE Dogbane is commonly called a weed, for it grows in grain-fields and meadows and it is not easy to destroy. It is a large plant, spreading out on the ground at the base, but it often grows up like a bush.

The flowers of the Dogbane are very pretty, even though it is a weed. Each flower has a small pink tube which is spread out like a funnel, and there are darker pink lines running from the top to the bottom of the tube. At the top of the tube are five small pointed lobes which are rolled back. In the center of the flower are five small yellow stamens which are placed close together, making a tiny tube around the top of the green seed-vessel. Outside of the pink tube is a short green cup in which the corolla is placed. This cup has five tiny lobes around the edge, and it is the calyx.

There are very many flowers to each plant. They grow in loose clusters at the ends of the branches, and each flower has a slender stalk of its own.

SPREADING DOGBANE
(1/3 nat. size) W = pink or white

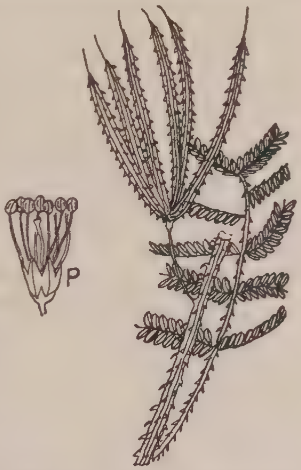
The leaves of the Dogbane are usually opposite each other, in pairs. They are dark green above and paler beneath. They are attached to the stem by short stalks, and have smooth edges. The tips are pointed. The plant has milky juice.

SENSITIVE BRIER

Morongia microphylla (Dryand) Britton = *Schrankia angustata* Torrey & Gray

OF ALL the remarkable characteristics of plants there is none stranger than the power of sudden movement that some possess. We can handle the leaves of violets, for example, without having any apparent effect on them, but there are a few plants whose leaves are set in motion by the slightest touch.

The dainty Sensitive Brier, which grows in dry soil from Virginia southward, has this characteristic in such a marked degree that when a leaf is touched the tiny leaflets fold against one another at once, and the leaf-stalk droops. If the foot catches sharply against a stem, this movement travels quickly from leaf to leaf, until the plant, that only a minute or two before had covered the ground with a delicate tracery of leaves, seems hardly more than bare stems. Even a few drops of water falling on the leaves causes this sudden motion. After a little time the leaves very slowly open again, and if touched again will close, but if the shock is repeated too often the plant seems to become "tired" and will not respond so readily.



SENSITIVE BRIER (1/3 nat. size)
P = pink

The Sensitive Brier is a very attractive plant, with prostrate, prickly stems several feet in length, twice pinnate leaves of many tiny leaflets, and globular pink flowering heads, about three-quarters of an inch in diameter, formed of many minute flowers with long stamens. These balls of flowers are borne during spring and summer on prickly stems (peduncles) from the axils of the leaves, and have a delicate fragrance. The long, narrow seed pods are armed with prickles, as the stems are. Early in the season both leaves and stems are a rich reddish-bronze in color.

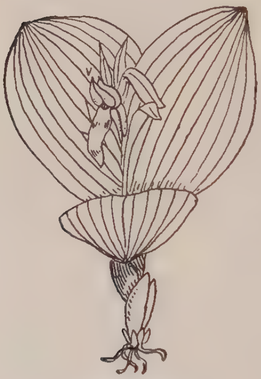
MARY FRANCIS BAKER.

SHOWY ORCHIS

Galeorchis spectabilis (Linnæus) Rydberg = *Orchis spectabilis* Linnæus

SHOULD you live in that part of the country where this beautiful little plant grows, it will not be long before you come across it. It loves the rich, moist woods, and is generally found beneath the hemlock trees, though you may also meet with it growing all by itself along streams in other kinds of woods, with alders and pussy-willows all about. Perhaps you may come across only one or two plants in a day's walk, and then, again, a good many more. We find the Showy Orchis over most of New England, and down to the State of Georgia, and westward to Nebraska.

It is a fine little plant to study, for you can dig up a perfect one when it is in full flower, and, carrying it carefully home in a paper cone, have the entire thing before you on your study-table. Its leaves, you will see, look almost exactly like those of the Lily-of-the-Valley in the garden, being broad and oval, with the rather strong veins running the whole length of each one; they are light green in color, and quite soft and shiny. Between these two leaves you note the stiff, nearly straight, stem, almost six inches long. It, too, is green, and not round, but angular. About an inch or more of its upper end is given over to the five or six very showy little flowers. They have their magenta-tinted petals and sepals united into a kind of little hood, which curves over the prominent lip below it, and the latter, instead of being magenta, is pure white. If front of it you may note the long, delicate spur which supplies the nectar for the visiting insects.



SHOWY ORCHIS
V = magenta-tinted

We are told that the bumble-bee is the one which comes most constantly to this Showy Orchis, and she has a bare, smooth face. This she bumps into the parts of the flower concealing the pollen, which sticks to her face, generally two extremely small plates or disks. Away she flies, carrying these with her to the very place where they will adhere to the sticky stigma of the next Showy Orchis flower she climbs into, and which may not be so very far away. This is how the seeds of this beautiful little plant are fertilized, so they will grow when they become ripe and get into the ground near where the mother plant grew.

In your tramps through the moist hemlock woods, looking for different kinds of flowers to study, you will, if you are lucky, come across some grand plants of this orchis; one or two may be some ten inches high, with fine large flowers on the stem.

Corn Cockle

Agrostemma Githago Linnæus

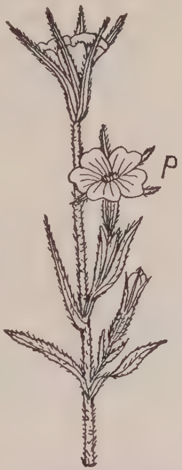
The Corn Cockle is a common weed which grows in corn-fields and grain-fields and is sometimes found in meadows and waste places. The large, beautiful flowers are red or pink and they bloom nearly all summer long. In shape they are much like a primrose.

The flower has five petals, and each petal has a tiny notch in the outer edge. Upon the petals are fine lines of dark purple dots, like rays, which run from the center of the flower almost to the outer edges of the petals. The heads of the ten stamens can only just be seen in the center of the flower where the five petals meet. In the center of the ring of stamens is the seed-pod with its many dark-colored seeds.

Below the petals is the green calyx-cup marked with ten ridges, and at the mouth of this cup are five narrow green teeth which are so long that they look like pointed leaves. These sepals are dark green inside but the outside is pale green and woolly. Their sharp points can be seen extending out beyond the petals of the flower.

The stem of the Corn Cockle is stiff and it grows up very straight. Like the calyx-cup it is covered with soft white wool.

The leaves grow in pairs on each side of the stem. They are long and narrow with pointed ends. Each leaf is dark green above, but the under side is always pale gray-green and woolly.

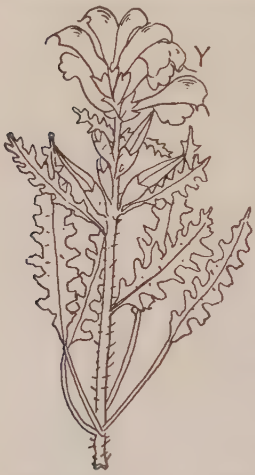


CORN COCKLE
(2/9 nat. size) P = red or pink

WOOD BETONY

Pedicularis canadensis Linnæus

THIS bright plant is very common in the woods and on rocky banks. It is a small plant and does not rise very high above the ground. It blooms in the spring and the flowers are red and yellow mixed, sometimes mostly red and sometimes mostly yellow. They grow very close together at the top of the stem forming a spike.



WOOD BETONY (1/2 nat. size)
Y = red and yellow mixed

Each flower is curiously shaped. The lower part is long, like a narrow tube, but at the mouth this tube spreads out into two lips. One lip rises straight up and bends over at the top like a hood; the other has three rounded lobes which fold back so you can look inside the tube of the flower.

At first you will see no stamens, but if you carefully push back the upper hood, the yellow heads of the four stamens will appear, and among these stamens you will find the green thread of the seed-vessel.

Each flower has a green calyx which folds about the bottom of the corolla-tube. If you look carefully you will see that it is cut down to the base on one side.

The stem of the Wood Betony is hairy and most of the leaves grow close to the ground. Each leaf is made up of many small fingers with deeply toothed edges. These lobes grow in pairs on each side of the center leaf-stalk, and there are frequently as many as six pairs of these fingers to one leaf. There is always a single finger at the end of the stalk.

CARDINAL FLOWER

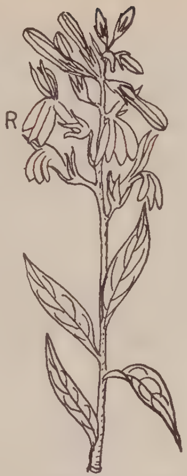
Lobelia cardinalis Linnæus

THE Cardinal Flower is one of our very showy wild plants. It grows in woods and wet places, and its bright flowers can be seen a long distance off. The plant grows up two or three feet high and has at the top a spike of bright red flowers.

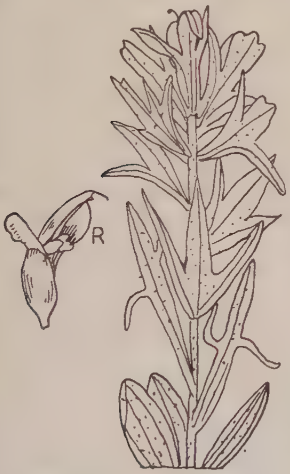
The corolla of each flower has three long narrow lobes which hang downward and make the lower lip of the flower. Standing up above these are two other lobes which are much narrower, and these form the upper lip. All of these five lobes are joined together and form a tube which is split down one side. Sticking out of the tube where it is split is a green or red tube which is curved at the top. This tiny tube is made up of the five stamens joined together. This tube is much larger toward the base, and if you break it off you will find that the large part is the seed-vessel. Outside the bright red corolla are the five long, narrow calyx-lobes, which are sometimes covered with hairs.

The leaves of the Cardinal Flower are ovate in shape and their edges are very finely toothed. There is a very narrow leaf where each flower-stalk is attached to the stem. On the under side of the leaf you will see one main vein with many smaller veins branching from it.

The stem of the plant has very shallow furrows running up and down its length. It is usually not branched.



CARDINAL FLOWER
(1/3 nat. size) R = bright red



SCARLET PAINTED CUP
(1/2 nat. size) R = bright red or scarlet

Scarlet Painted Cup

Castilleja coccinea (Linnæus) Sprengel

In meadows and pastures and swampy places you may see the fields bright red or scarlet with the flowers of the Painted Cup. You may also find the plant on prairies or on sandy ground. As you get closer to the plant it does not look so pretty as at a distance, and you will see that the showy red is on the leaves near the top of the plant. These red leaves are rounded at the tips and their edges are either smooth or lobed.

Just above these leaves are the small yellowish flowers. The corolla of each flower has two lips. The lower lip is short and has three lobes on its edge; the upper lip is longer and stands straight up. It has a tiny notch in the center. Sticking out from above the upper lip is a long, green stalk. If you trace this stalk down to the bottom of the corolla-tube you will find that it is the top of the seed-vessel.

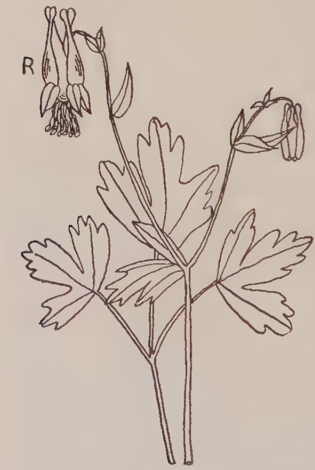
Just inside the lip are the four stamens with their hairy heads. The stamen-stalks are attached to the yellow corolla-tube. By pushing away the red leaves you will find the calyx of the flower. It is a short green tube with two pointed lobes.

The leaves of the Painted Cup are scattered on the stem. Some have smooth edges, and some are lobed. Those at the base of the plant are usually much broader than those further up the stem. The whole plant is covered with short white hairs.

Wild Red Columbine

Aquilegia canadensis Linnæus

This is one of the most interesting of our spring plants, and its bright flowers are easily seen as they grow upon the rocky banks in the woods. Each plant has several flowers.



WILD RED COLUMBINE
(1/3 nat. size) R = scarlet

Each flower has five long spurs which stand nearly straight up, and at the end of each spur is a tiny knob. If you turn the flower over you will see an opening leading into each spur. These openings are yellow, while the outside of the spur is red. The five spurs are really the petals of the flower. Between each two spurs is a red sepal which looks very much like a petal. The sepals are ovate in shape and have pointed tips.

The flower has many yellow stamens. Those nearest the center of the flower have long stalks, while the outer ones have very short stalks. In the center of the stamens are the five green seed-vessels.

Each flower has a very slender stalk. It is not strong enough to hold the flower straight up, but after the petals and sepals have fallen off, the slender stalk becomes stiffer and the seed-vessel then stands straight up. The leaves of the

Wild Columbine are made up of small leaflets, and each leaflet is cut into three or four lobes.

Should you go back some distance from the plant and keep very still you may see a humming-bird visit some of the flowers. He runs his long, slender bill up into one of the spurs and sucks the honey from the little knob at the end.

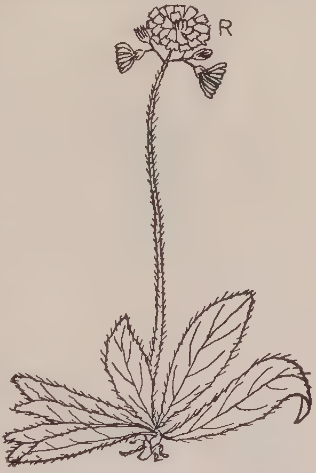
Paint-brush

Hieracium aurantiacum Linnæus

The Paint-brush is a common weed which often forms large patches in fields and waste places and along roadsides. It is a very pretty plant with its bright orange flowers, but the farmers do not like it, because it destroys their meadows and pastures.

The flowers are much like those of the Dandelion. There are many tiny flowers with broad straps packed tightly together in a head. At the outer end of each strap are five small teeth, and at the bottom of the strap is a very short tube. Sticking out of this tube is a little yellow stalk, which is made up of the stamens, joined together. At the tip of this stalk is a tiny yellow thread with two coiled branches. On the outside of the head are many narrow green leaves which are pressed closely against the orange straps.

There are several heads near together at the end of the stem, each having a short stalk of its own. Not all the heads open at the same time. They open only on bright days, and close at night-time and in rainy weather. When the seeds are ready to be scattered the head appears like a brown ball of cotton, for each seed has many short, brown hairs attached to it.



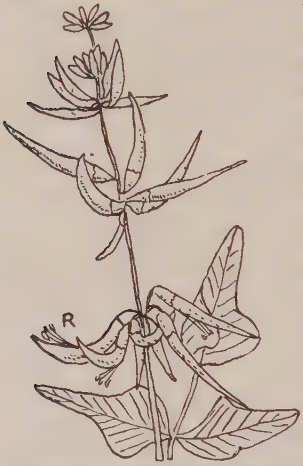
PAINT–BRUSH (1/3 nat. size)
R = red or orange

The leaves of the Paint-brush form a rosette and lie flat on the ground. Some of the leaves are stalked, but those in the center of the rosette have no stalks. The edges of the leaves are usually smooth, but sometimes have blunt teeth. The leaves and the stem of the plant are covered with sticky hairs.

CHEROKEE BEAN OR CORAL PLANT

Erythrina herbacea Linnæus

AMONG native plants of the Pea Family are several whose flowers show peculiar variations from the usual form. The Cherokee Bean, one of our most striking representatives of this family, has bright-red flowers formed almost entirely by the elongated upper petal (the "standard"), which is narrow and sharply folded, while the two petals at the sides (the "wings") and the lower petals (the "keel") are minute.



CHEROKEE BEAN OR CORAL PLANT (1/3 nat. size)
R = scarlet

This interesting plant with conspicuous flowers grows in thickets and sandy soil in the South, being most common in the Gulf States, where it blooms in spring and early summer, or even in mid-winter in the Florida peninsula. The stout stems, two to five feet tall, are slightly thorny; the many flowers, one to two inches in length, are borne in long racemes and often bloom before the leaves appear. The leaves are three-foliate, the leaflets, an inch or more in length, are triangular and are somewhat three-lobed. The seed-pods, three to five inches long, are interesting, for they are oddly narrowed between the seeds, and, when ripe, open and show bright scarlet beans, which ornament the seed-pods for some time before falling.

A taller relative, the Coral Tree or Coral-bean Tree (*Erythrina arborea*), with similar flowers, grows in southern Florida, and large trees of this genus have long been cultivated in India, where a picturesque legend attempts to account for their rare beauty. According to this legend, Coral Trees once ornamented the garden of heaven, but their brilliant flowers tempted Krishna to steal them, and, therefore, they were banished from heaven and condemned to grow on the earth.

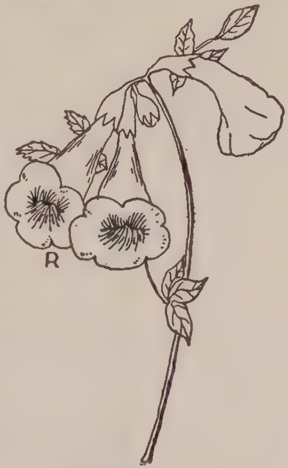
MARY FRANCIS BAKER.

TRUMPET CREEPER

Bignonia radicans Linnæus = *Tecoma radicans* (Linnæus) Jussieu

QUITE often you will come across flowers, those of trees and other plants, that you can name as far as you can see them. For example, when a Horse-chestnut Tree is in full bloom, any intelligent boy or girl, knowing one common tree from another, can, all being equal, state offhand that it is a Horse-chestnut Tree, for the numerous big panicles of creamy flowers are as familiar to them as are roses on a rosebush. This should not stand in the way, however, of your studying all parts of such flowers, common and familiar though they be. This is true also of our Trumpet Creeper, known sometimes as Trumpet Flower or Trumpet Vine.

When a number of years old, and it has had the best of opportunities to grow, it spreads over things tremendously; and its dark leaves and big trumpet or funnel formed scarlet and orange flowers may be seen by a good pair of eyes a long distance off. This woody vine, with its compound leaves, makes its way over stone walls, porches, sides of houses, and into trees in open woods by means of strong, aerial roots or suckers, which you should carefully examine. You will find the flowers, usually in clusters, sticking out from a common stem.



TRUMPET CREEPER
(4/15 nat. size) R = scarlet

Plucking a good, big, single one for study, you will note that its pretty, bell-shaped calyx is five-toothed, and that the somewhat irregular corolla is five-lobed. There are four stamens, the whole flower being between two and three inches long, and it has a single pistil. As many as ten flowers may occur in any of its single clusters, and they drop off very easily after they have been out a little while. The saw-edged leaflets are arranged opposite each other along a common stem, with a single leaflet at the end. In number, they seem to run from seven to eleven, and you should satisfy yourself on this point by counting them.

In nature you will find this splendid creeper most often in thickets, or in damp, rich woods. Occasionally where grass, many weeds, and various plants grow, near the wood's edge, a Trumpet Creeper will climb over them all, and dwarf or kill them with its weight or shadow. It blooms from August till early fall; and in New England it is planted as an ornamental vine for porches and arbors, while in the West it is ripped out everywhere as a troublesome weed. It is native to the greater part of eastern United States, especially in the South. Our humming-birds are passionately fond of the flowers of this vine, and no wonder; for not only are they attracted by their brilliant color, but, as food-reservoirs, they actually seem to be made for the bird in every way.

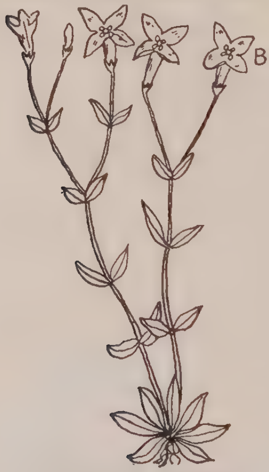
BLUE FLOWERS

BLUETS

Houstonia cærulea Linnæus

THESE little plants are found in grassy places and on moist, rocky banks. The blue flowers are not very large, but they are very pretty as they grow among the grass-blades.

At the end of each branch of the plant is a blue flower with a yellow center. Each corolla has four spreading lobes which are joined together and form a slender tube at the base. When the flower is in bud the four lobes are folded around each other and stand straight up, but when the flower opens they lie flat out. Where the lobes join to form the flower-tube they are yellow instead of blue.



BLUETS (1/2 nat. size)
B = blue, violet, or white with yellow center

In the center of the flower are the four yellow stamen-heads peeping out of the tube. If you split the tube open you will find that the stamen-stalks are attached to the inside of the tube. Coming up from the bottom of the tube is a green thread which is attached to the seed-vessel. Outside the corolla is the green calyx with its four pointed lobes. It is much shorter than the corolla-tube.

After the blue corolla has withered and fallen off, the seed-vessel remains at the end of the stalk. It is deeply notched at the top, and when you break it open you will find inside many rough hard seeds.

Some of the leaves of the Bluets are arranged in a rosette at the base of the plant, while those on the stem of the plant are opposite each other and in pairs. The leaves are small and have smooth edges. Each leaf has a single vein which runs from base to tip.

BITTERSWEET

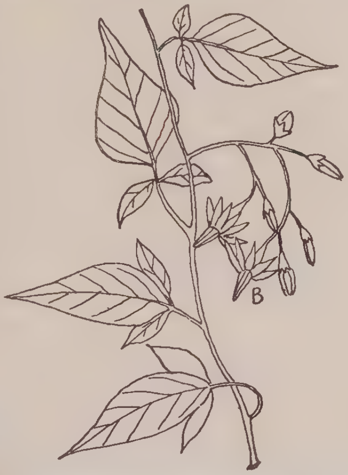
Solanum Dulcamara Linnæus

The Bittersweet is a common wild plant that is found in moist places and in thickets climbing on banks and walls and among the bushes. The stem of the plant often twines around other plants. It is branched and is sometimes covered with fine hairs.

There are several flowers near together, but only two or three are open at the same time. In the center of each flower is a yellow cone which is formed by the five stamen-heads joined together. Coming out through the top of this yellow cone is the green top of the seed-vessel. Each stamen has a very short stalk.

The five blue petals form a ring around the base of the yellow cone. They are pointed, and lie flat out. There are two yellow spots on each petal near the place where it is attached. If you try to pull off a petal you will find that the five petals are joined together at the base. Beneath the petals are five short, green sepals with their bases joined together.

Even when the flowers are in bloom you may find upon the plant, bright red berries which are smooth and shining, and very pretty. These are the ripe seed-vessels of flowers that have withered and fallen off.



BITTERSWEET (1/2 nat. size)
B = blue, purple, or white

The leaves of the Bittersweet are not all alike. Some are made up of three leaflets which have smooth edges. The middle leaflet is larger than the other two. Some leaves are lobed, while others are ovate and pointed and have no lobes.

This plant belongs in the same family with the cultivated potato, and it should not be confused with Climbing Bittersweet (*Celastrus scandens*), a woody twiner, from which it is very different.

SELF-HEAL

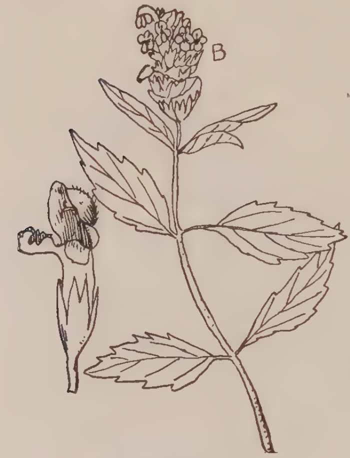
Prunella vulgaris Linnæus

The Self-heal is found in nearly all parts of the United States, growing in fields and woods and waste places. Sometimes the plant spreads along the ground, and sometimes it stands straight up. The stem is four-sided and branched. At the end of each branch is a cluster of blue or violet flowers arranged in a short thick spike.

Each flower is small, but very interesting. The corolla is a slender tube which divides at the top into two lips. The upper lip stands straight up, and its sides are folded like a hood. In the middle of the lip is a tiny notch. The lower lip is divided into three lobes, and the edge of the middle lobe is folded upward and is very uneven. The edges of the other two lobes are folded under and are nearly smooth.

Inside the upper lip you will see snugly tucked away four stamen-heads. They are in pairs, two of them sitting higher up than the other two. If you follow the stamen-stalks down you will find that they are attached to the inside of the corolla-tube. Among the stamens is a green thread which rises from the seed-vessel.

Each cluster of two or three flowers has beneath it a broad rounded leaf which presses close against the calyx and almost hides it. If you pull back this leaf you will see that each flower has a green or purple calyx-tube with five pointed teeth. The calyx is sometimes covered with hairs.



SELF-HEAL (1/2 nat. size)
B = blue or violet

The leaves of the Self-heal are ovate, and their edges have blunt teeth. Each leaf has a stalk.

GROUND IVY

Glecoma hederacea Linnæus = *Nepeta hederacea* (Linnæus) Trevisan

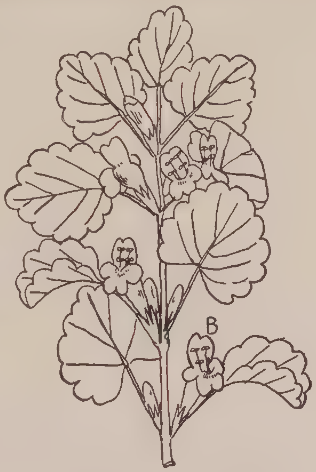
THE Ground Ivy bears little resemblance to the common ivy that you know so well. It is a creeping plant with a square stem which is very hairy and is usually tinged with pink. It is common along roadsides and in waste places, and blooms all summer.

The flowers have no stalks, they grow in circles close to the stem where the leaves spring from it. There are usually six or more flowers in a circle.

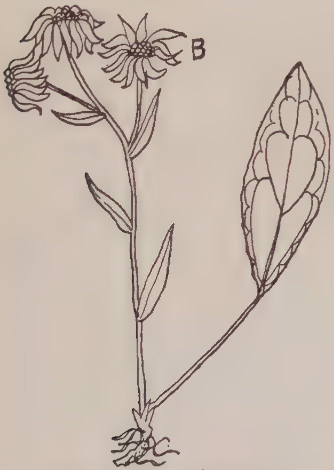
Each flower is a blue or purple tube prettily divided at the mouth into two rounded lips. The lower lip is marked with white and dark purple blotches. Inside the corolla-tube are four small stamens with yellow heads. You can just see them at the mouth of the tube, and among them the forked tip of the seed-vessel. The flower has a green calyx-cup which is very hairy, and is edged with five long sharp teeth.

From each side of the stem, close among the flowers, grow two leaves on short stalks. These leaves are round and their edges are beautifully scalloped. Each leaf is covered with a network of veins and is sometimes hairy on both sides, as well as around the edge.

The circles of leaves and flowers grow at intervals all the way up the stem, with a few inches between each circle. The flowers in the lower circle open first.



GROUND IVY (4/9 nat. size)
B = blue or purple



WILD ASTER (1/3 nat. size)
B = blue

WILD ASTER

Aster sp.

YOU can scarcely go out into the fields in the late summer or autumn without finding the beautiful flowers of the Wild Asters. The fields are often blue or white with these daisy-like blossoms. The flowers grow on short stalks which branch from the upper part of the main stem.

Each flower-head is made up of many tiny flowers and these are of two kinds. In the center is a crowded mass of tiny tube-flowers which are evenly notched around the mouth. They are yellow or purplish in color. Outside these tube-flowers is arranged a ring of large flowers. Each of these larger flowers has a short tube which spreads out into a broad strap at one side. These blue or white straps stand out like a frill around the center bouquet of tube-flowers. Each flower-head is placed in a green cup made up of several rows of small, green, pointed leaves laid closely one above another like the scales of a fish.

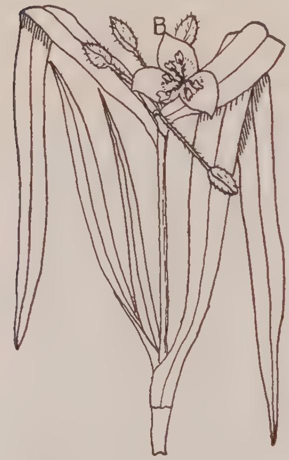
After the flowers have withered and fallen off, the seeds still cling to the end of the stalk, and each seed is winged with a tuft of dingy white cotton down, just as you have seen in the thistle. When the seeds are ripe the wind blows them away from the plant.

There are many different kinds of Asters. Some have broad leaves with toothed edges, while others have narrow leaves with smooth edges. Sometimes the leaves are stalked, and sometimes there are no stalks. The flowers are usually purple, blue, lavender, or white. You should notice as many different kinds of Asters as you can, since they are so common everywhere.

SPIDERWORT

Tradescantia virginiana Linnæus

THE Spiderwort grows in woods and thickets and sometimes in patches on moist banks.



SPIDERWORT (1/3 nat. size)
B = blue

Its blue flowers are found in clusters at the ends of the branches. Each flower has three rounded blue petals which are shaped somewhat like a saucer. Behind the three petals you will see the three rounded green sepals.

In the center of the flower are the six stamens. If you look closely you will see that each stamen-stalk is covered with tiny hairs. The stamen-heads are often blue. Inside the ring of stamens, in the very center of the flower is the green seed-vessel.

Beneath each cluster of flowers on the stem are two little boat-shaped leaves which fit into each other rather closely at the base. Before the flowers open these boat-shaped leaves surround the tiny buds.

The plant usually grows spreading on the ground, and if you pull it up you may find tiny white roots coming out near where the leaves are attached to the stem.

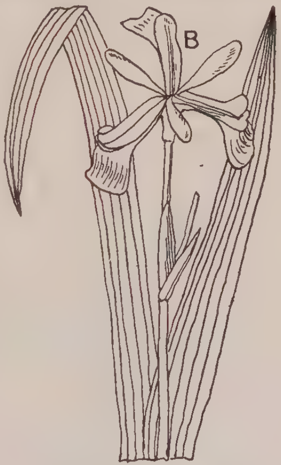
The leaves of the Spiderwort are usually long and slender with pointed tips. The edges are smooth. Sometimes the leaves are folded so as to make a channel in which water may run down the leaf to the stem. These leaves have no stalks.

BLUE FLAG

Iris versicolor Linnæus

THE Blue Flag with its iris flowers and sword-like leaves is found in the summer time by the side of ditches, marshes, and ponds. The flowers are large and showy, and grow one or two together at the top of the stalk.

The petals and sepals are almost the same color. The flower has a short calyx-tube which folds back at the mouth into three beautiful broad violet sepals, which are marked with orange streaks. Between each two of these sepals stands a narrower paler violet petal. Rising in the center of the flower you will see what you may think are three other pale-blue petals with fringed ends which curl upward. These are really the three branches of the slender column which rises from the center of the seed-vessel. Half-hidden under each of these fringed branches you will see a stamen closely pressed against it. The seed-vessel is below the flower-tube. This seed-vessel becomes very large after the flower has withered, and bursts into three parts showing the rows of dark brown seeds tightly packed together inside.



BLUE FLAG (2/5 nat. size)
B = violet-blue, variegated with yellow, green, and white

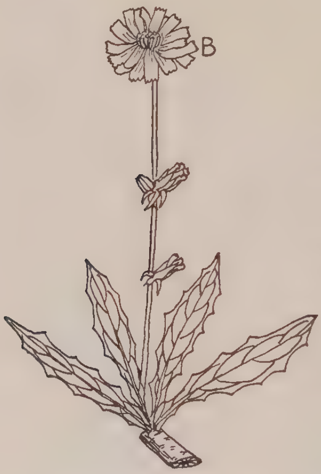
Before the flower opens it is partly inclosed in a green sheath, and you can see the blue sepals folded around each other. The smooth leaves are sword-shaped, with long lines running from base to tip. They are pale green in color.

CHICORY

Cichorium Intybus Linnæus

You will find this common wild flower along roadsides and in fields and waste places. Often the fields are blue with the large showy flower-heads.

What appears at first to be a single large flower is really a head of very small flowers, just as you have seen in many other plants. Each tiny flower has a broad blue strap which has five teeth at its outer edge. The outer edge of the strap is not printed but is straight across. There are tiny lines running from the outer edge of the strap down to the base where it forms a short tube. Coming out of its tube is a little yellow stalk which is made up of all the stamens joined together. Before the flowers are all opened those in the center of the head look like little blue stalks. If you pull the head to pieces you will find at the base of each flower a little seed-vessel.



CHICORY (1/3 nat. size)
B = blue

Outside the head of blue flowers are two rows of very narrow leaves. One row stands straight up and is pressed against the flowers, while the leaves of the other two spread apart and are often folded backward toward the stem. There are several of these blue heads scattered toward the top of the plant, and each head has a short stalk.

Many of the leaves of the Chicory are close to the ground, and these form a rosette. They are large and have very coarse teeth around the edges. There is one large vein on the under side of each leaf, with many smaller veins branching from it. These small veins bend around and join other small veins. The leaves further up the stem are much smaller than those near the ground.

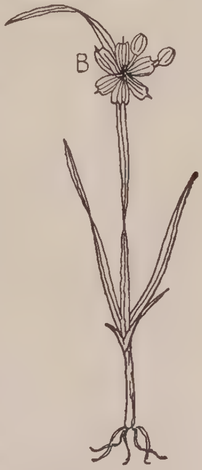
BLUE-EYED GRASS

Sisyrinchium sp.

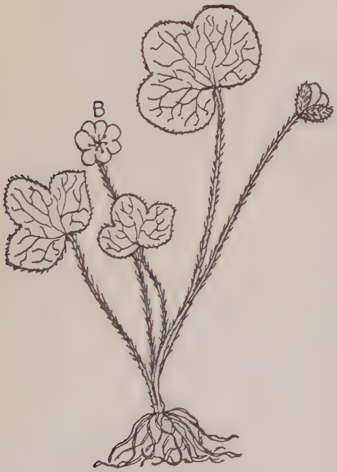
Peeping up here and there among the clusters of long, grassy leaves on wet and marshy ground you will find dainty blue flowers. You will notice that the base of each perianth-segment is yellow instead of blue.

At first you may think that the flower has no stamens, but if you look very closely you will see the three tiny yellow stamen-heads all united and pressed closely around the tip of the seed-vessel. As you turn the flower over you will see that there are no green sepals, but just beneath the blue petals is a small round green ball. This green ball is the seed-vessel. After the seeds are ripe the seed-vessel breaks open at the top and forms a little cup which holds the tiny black seeds.

Two or more flowers may be found at the top of the stalk, and each flower has a slender thread-like stalk of its own. The flower-stalks seem to come out from the inside of two green boat-shaped leaves which fold around each other. The stem on which the flowers grow is flat and green and is much thicker in the middle. The leaves of the Blue-eyed Grass are very much like the grass-blades in our fields and meadows.



BLUE-EYED GRASS (4/9 nat. size) B = deep violet blue



HEPATICA (1/3 nat. size) B = blue or white

HEPATICA

Hepatica Hepatica (Linnæus) Karsten = *Hepatica triloba* Chaix

THE Hepatica is probably the very first flower that you will find in the woods in the spring. Just after the snow is gone, if you look carefully along the dry woody banks where the sun first warms the earth, you may find these beautiful blue or white flowers. Several flowers often grow in a cluster, and each one is at the end of a hairy stalk.

Each flower has six or more sepals which lie flat out when the flower is fully opened. The sepals are rounded at their outer edges and usually have blue or pink veins upon them.

Just inside the sepals is a ring of very many yellow stamens. Those on the outside of the ring have longer stalks than those on the inside. In the center is a round ball of green seed-vessels.

In the bud the petals are entirely covered by three hairy, green, involucral bracts which look like sepals. The flower opens each day as the sun shines upon it, and at nighttime the bracts close over the sepals again. The first day the flower is small and cup-shaped, not open very wide, but the second day it is larger and wider open than the first day. After several days the petals wither and fall off, and the three green involucral bracts fold over the bunch of seed-vessels.

You may not always find the leaves of the Hepatica when you find the flowers. The old leaves which grew the year before may remain on the plant throughout the winter until the new flowers appear. The leaves are rounded and smooth and are divided into three lobes. They have long, hairy stalks.

LUPINE

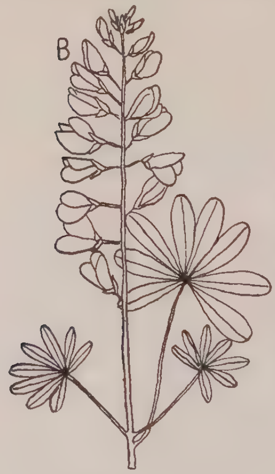
Lupinus sp.

On the prairies of the Western States one of the very common wild plants that bloom in summer is the Lupine. In other parts of the country it is sometimes cultivated in gardens for its beautiful blue or purple flowers.

You can easily learn to know the Lupine by its leaves. Each leaf is made up of seven or more long, narrow leaflets which are attached near together, and spread out like the fingers of a hand. These leaflets are sometimes two inches long and have smooth edges. The leaves, the leaf-stalks, and the main stem of the plant are covered with long, silky hairs.

The flowers of the Lupine are blue or purple, and several of them grow together toward the end of the stem. Each flower has a very short stalk of its own. Where this stalk is attached to the main stem there is a very small leaf.

The Lupine belongs to the Pea Family, and so has a flower somewhat like the Sweet Pea. There is one broad petal which stands straight up, with its sides folded backward. It looks as if made up of two narrow petals joined together. Just below this broad petal are two smaller ones which are opposite each other. If you pull these two side-



LUPINE (4/9 nat. size)
B = blue or purple

petals apart you will find a boat-shaped petal which is entirely hidden by the other two.

Inside the boat-shaped petal are the stamens and the seed-vessel. Outside the petals are the five green sepals, which have their bases joined together to form a short tube.

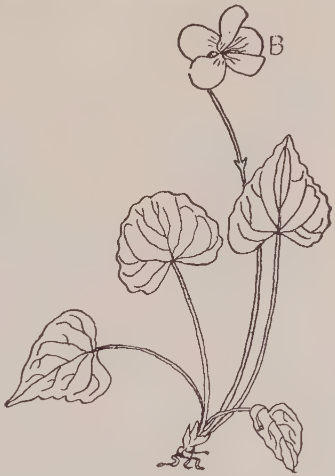
Blue Violet

Viola sp.

The Blue Violet begins to bloom early in the spring. There are many kinds of Blue Violets, and one or more of them may be found in most parts of the country, in woods and pastures and along the banks of streams. Sometimes there are so many together that they form a great mass of blue.

Nearly every one knows the Blue Violet, but it is interesting to pull a flower to pieces and see how curiously the petals are shaped. The five petals are blue or purple, at the broad end, but the narrow end is almost white. This narrow end is nearly hidden by the green sepals. Four of these petals are much the same, but sometimes two of them have little tufts of hair near the base. The fifth petal is larger than the others and its narrow end is shaped like a small tube or spur. This tube is not hidden in the calyx, but extends out beyond it.

In the center of the flower are the five stamens, and all their yellow heads are joined to edge in a ring around the seed-vessel. Below the petals are the five sepals with very sharp points. The lower part of each sepal is slightly swollen.



BLUE VIOLET (4/9 natural size)
B = blue

The leaves of the Blue Violet are usually heart-shaped with toothed edges, but sometimes they are cut up into many lobes. Sometimes the leaves have long stalks, but often the stalks are very short.

You may also find White Violets with blue veins upon the petals. These are usually smaller than the Blue Violet. The Pansy is a kind of

Violet and it has a pleasing odor, while the field Violets are usually scentless.

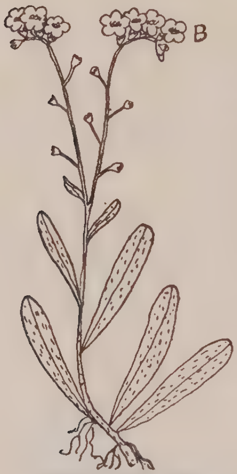
FORGET-ME-NOT

EVERY boy knows the dainty, pale-blue flowers of the Forget-me-not. The plant is found growing in ditches and in wet places by the sides of brooks, and sometimes it is cultivated in flower-gardens, where it forms great mats of tiny blue flowers. It is a straggling, slender plant, sometimes a foot high.

Each flower has five small rounded blue petals which lie almost flat open like a wheel, and in the center is a bright yellow eye. The stamens are hidden from sight in the small blue tube formed by the lower parts of the petals, and so is the seed-vessel. Below the blue petals is a green calyx-cup which is hairy all over, and around the mouth it is edged with sharply pointed teeth.

Each flower has a short stalk and these stalks are arranged along the stems above the leaves. The flowers lowest on the stem blossom first, and the pink buds are always at the very top of the branch. The top of the stem is often curved over until the buds are ready to open.

The dark-green, hairy leaves of the Forget-me-not are long and narrow, with blue points and smooth edges. They have no stalks, but often clasp the stem. They are very smooth and glossy.



FORGET-ME-NOT
(4/9 nat. size) B = blue with yellow eye

The slender stem is four-sided and hairy, and it creeps along the mud before it rises to bear the leaves and flowers.

WILD MONKSHOOD

Aconitum uncinatum Linnæus

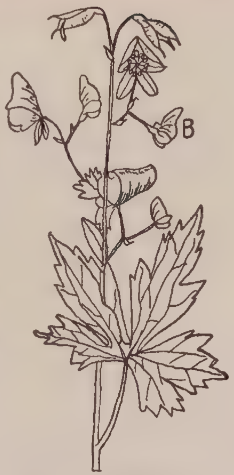
THE Monkshood is a showy wild flower which grows two to four feet high. It is branched at the top, the flowers being in a panicle.

The flowers are blue and each has a short stalk. The Monkshood is much like the Larkspur in some ways, but you will see that it has no spur or tube upon its upper petal.

Each flower has five sepals, but they are not all alike. The one at the top is shaped like a cap or hood, and this gives the plant its name.

Inside the petals are very many stamens with their stalks joined together to form a short tube. The tiny round stamen-heads are at the tips of the stalks. Among the stamens you may find three, four, or five green thread-like stalks, each with a green knob at the end. If you push aside the stamens you will see that the green stalks are attached to the seed-vessel.

Like the leaves of the Larkspur, those of the Monkshood are deeply cut up into narrow lobes. Each lobe is toothed or lobed again. If you pull up the plant you will find that it has a large thick root. This root is poisonous.

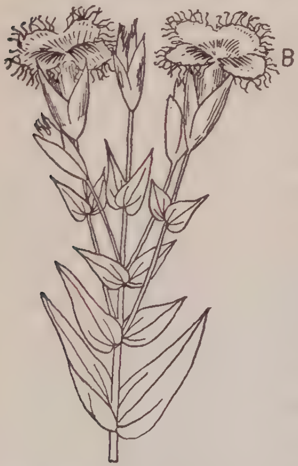


WILD MONKSHOOD
(4/15 nat. size) B = blue

Fringed Gentian

Gentiana crinita Froelich

One of the most beautiful flowers that bloom in the later summer and autumn is the Fringed Gentian. You will find the bright blue blossoms in moist woods and meadows and in marshy places. There is usually one large flower at the end of each branch.



FRINGED GENTIAN (2/5 nat. size)
B = bright blue

The flower has a large tube which spreads out at the top into four lobes, and these lobes are fringed all around with beautiful blue threads. This is why it is called Fringed Gentian. The four stamens are inside the tube, and their white stalks are attached to the corolla near the bottom of the flower. In the center of the tube is the long seed-vessel with a large knob at the top. This knob often stands up higher than the stamen-heads. Outside the corolla is the green calyx-tube with four pointed lobes which reach almost up to the fringed lobes.

The stem of the Fringed Gentian is round and smooth and grows from one to two feet high. It has several branches which are usually curved before the flowers open.

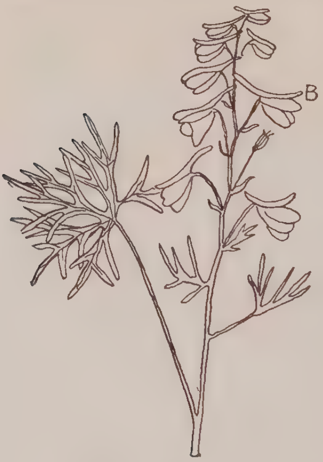
The leaves are placed opposite each other in pairs. They are pointed at the tips, but are much broader toward the base. Sometimes the leaf is attached to the stem by a short stalk, but often there are no leaf-stalks. There is one large vein which runs from the base to the tip of each leaf.

Before the flower unfolds the lobes of the corolla are folded around each other very tightly, and the fringes make the bud look like a little brush. If you pick a flower the corolla-lobes will soon fold up, and will never open again as those of some flowers do.

LARKSPUR

Delphinium sp.

IN the Western States the fields and mountain-sides are often covered with the beautiful blue flowers of the Larkspur. Several flowers are borne close together near the top of the plant, and each flower has a short stalk. Where each flower-stalk is attached there is a narrow, pointed leaf.



LARKSPUR (1/3 nat. size)
B = blue

The flower of the Larkspur has five sepals, and one of these has a long spur or tube which stands straight out. The inside of this spur is pale blue or yellow. The four other sepals are sometimes joined together at the base. Inside this ring of sepals, and just below the one with the spur, are two very small petals. Each of these has a tiny spur and these two spurs extend down into the spur of the large sepal. Sometimes there are two other small petals.

In the center of the flower are many stamens, each with a long slender stalk and a small yellow head. Among these stamens you may find a green stalk which has no head. This is the top of the seed-vessel.

The leaves of the Larkspur are scattered on the stem, and there are usually very many of them. Each leaf is much lobed, and the lobes extend out from the stalk like the fingers of a hand.

SKULLCAP

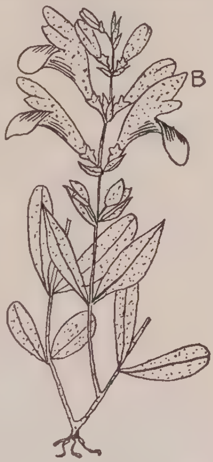
Scutellaria integrifolia Linnæus

THERE are over a dozen different kinds of plants that have been called Skullcaps; but they are in the same group, and all belong in the Mint family. You, no doubt, already know some of the Mint Family as the common Catnip, the Gill-over-the-ground, some of the Nettles, and Bugle Weed. The Skullcaps will give you some little trouble in distinguishing them; but a description of one of the commonest will help you with the others.

Let us choose the larger or Hyssop Skullcap as an example, for in it the flowers are pretty big, while in some of the other kinds they are so small that you would hardly notice them. They are called Skullcaps, or Helmet-flowers, for the reason that the first describer of them thought that the added part of the upper lip of the calyx looked like a little dish. Others thought they resembled little helmets, so we have them called Helmet flowers, also Hoodwort, and other names.

The Hyssop Skullcap is very abundant in some places; and on account of its bright blue flowers you can hardly pass it without seeing it, although it is rarely over a couple of feet high, and generally stands in with other thickly growing plants that are much taller than itself. Sometimes its flowers are pure white, but this does not happen very often. They come out at the tops of the stems; each is about an inch in length, several being grouped opposite each other.

When the plant is in fruit, if you touch the cup of the upper lip of the calyx, it will fly open, and you may see the four little dark-colored seeds within. This one thing will let you know that you have one of the Skullcaps at hand. Like the calyx, the corolla has two lips, the lower, spreading one having three lobes, the outer ones being smaller than the middle one. There is one pistil, with its style split unequally in two. Then you will find four stamens which are arranged in pairs, the lower pair being the larger.



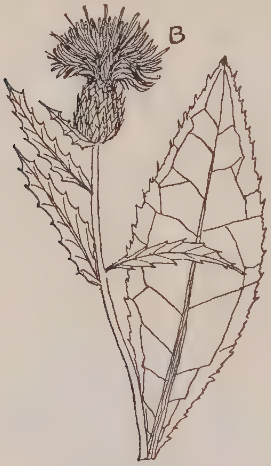
SKULLCAP (4/9 nat. size)
B = bright blue

Passing to the slender-pedicelled leaves, you will see that they are thin, and have toothed margins or edges, and that they are opposite each other on the stem. The upper leaves are most often lance-shaped, the lower ones broader, or of an oblong shape. You will most often find four little seeds in the pod of the Skullcap in the fall, while it holds its flowers from May to the end of August.

THISTLE

Cirsium sp.

EVERY boy knows the Thistle. It is a plant that perhaps you do not like to see, and much more do not like to handle, because of the sharp spines that are scattered over it. It is a very common plant and is found almost everywhere that plants can grow. The stem of the Thistle is stiff, and stands straight up. It is sometimes white and woolly.



THISTLE (1/3 nat. size)
B = dull purple

The flowers are a dull purple color and grow in a dense head, forty or fifty of them packed closely together. If you pull one of these heads to pieces you will find that each flower is a tiny purple tube with five small teeth at the top. The base of each tube is surrounded by a covering of white down.

When the seeds have fully formed, and the flowers have withered and fallen off, the flower-head will appear like a ball of white wool. If you blow upon this ball, the tiny seeds with their numerous white hairs will be carried away in the breeze.

Just outside and below the flower-head are dozens of tiny narrow green leaves, close together. Each leaf ends in a sharp point, and it is this prickly green covering that makes the flowers difficult to gather.

The leaves of the Thistle have very sharp spines on their edges. They are dark green and are thinly covered with gray down. The young leaves are white and woolly when they first unfold.

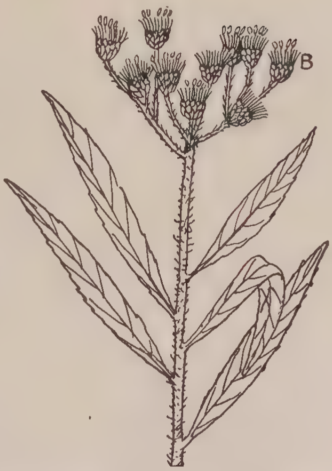
IRONWEED

Vernonia sp.

THE Ironweed is a tall plant which grows in fields and waste places nearly all over the United States. It stands three feet or more high, and at the top are several heads of small purple flowers. Each head of flowers has a short stalk. The flowers bloom in mid-summer and autumn. Each flower is a small purple tube with five teeth at the top. Inside the tube is a little green or yellow stalk which is made up of the stamens joined together. Where the tube is attached to the seed-vessel there is a ring of white hairs which stand straight up.

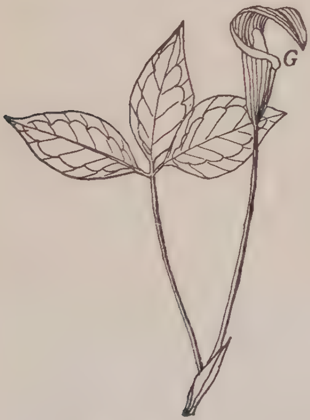
Outside the flower-head are many rows of small purple or brown leaves with pointed tips. If you pull off all the flowers of the head these leaves will remain and form a cup.

The leaves of the Ironweed are long and narrow and their edges have sharp teeth. The leaves near the flowers are much smaller than those toward the base of the plant. Some of the leaves have short stalks, but some are without stalks.



IRONWEED (1/3 nat. size) B = purple

The stem is very stiff and straight and is branched near the top. It is often covered with fine hairs.



JACK-IN-THE-PULPIT (1/3 nat. size)
G = green or purple

JACK-IN-THE-PULPIT

Arisæma triphyllum (Linnæus) Torrey

When you walk in the woods in the springtime the Jack-in-the-pulpit is one of the interesting plants that you will find.

You will perhaps notice first the broad green sheath with its purple stripes. It is split down one side and has a pointed flap which projects over the opening of the tube.

When you turn back the flap and look inside you will see a pencil-like spike standing straight up in the middle. This spike is green or sometimes purple and is rounded at the tip.

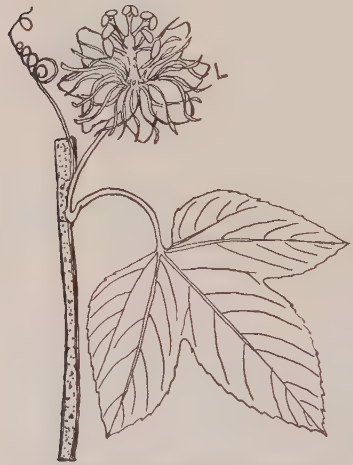
If you fold back the edges of the tube where it is slit down on the side, you will find at the bottom of the spike a dense cluster of tiny green flowers. In some plants you will see only stamens, and in others only seed-vessels. These tiny flowers have no petals or sepals.

The leaves of the Jack-in-the-pulpit are made up of three pointed, ovate leaflets which have smooth edges. The leaves have short stalks which clasp the stem at the base. Each plant usually has only two leaves.

If you pull up a Jack-in-the-pulpit you will find that it has a turnip-like root, and for this reason the plant is sometimes called the Indian Turnip. There are several thread-like roots extending from the main root.

PASSION FLOWER OR MAYPOP

Passiflora incarnata Linnæus



PASSION FLOWER OR MAYPOP
(1/3 nat. size)
L = lavender

THE beautiful Passion Flower, which blooms in dry soil from Virginia to Florida and Texas, is remarkable both for its flowers and for the story connected with them.

The flowers, two inches across, are formed of five sepals and five lavender petals, but above these is an unusual feature that no other native flower possesses, for a circle of many slender lavender filaments, banded with purple and white at the base, lies over the petals. Above this "corona," as it is called, the young seed-pod is oddly raised on a stalk from which the five stamens spring, and three styles complete the flower. The plant is a vine that climbs by tendrils, or lies on the ground when support is lacking. The alternate leaves are deeply lobed, and glands on the leaf-stalks (petioles) exude a sweet, colorless secretion when the plant is in bloom. The pulpy oval fruit, two to three inches long, is edible.

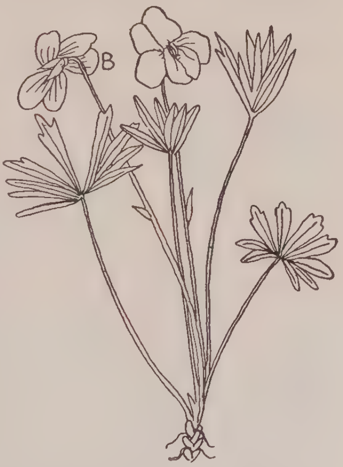
The common name of plants in this genus is a reminder that when Spanish explorers first saw them in South America they were so struck by the unusual flowers that they believed them to be miraculous symbols of the sufferings of Christ, and accordingly taught that the tendrils represented the whips with which he was scourged, the five stamens were the five wounds, the corona was the crown of thorns, the petals and sepals were ten disciples (Peter and Judas being absent), the seed-pod was the sponge dipped in vinegar, and the lobed leaves were the hands of Christ's persecutors.

MARY FRANCIS BAKER.

BIRD-FOOT VIOLET

Viola pedata Linnæus

IT WOULD be rare indeed to meet with any boy or girl who would not be familiar with the form of a violet; for violets are, from pansies to the wild blue violet, among the best and most widely known flowers we have. Little use is it, then, to describe all its parts, or even how it grows. Gray's "Manual" lists forty-five different kinds of violets for the eastern part of the United States alone; but there may be a much larger list than this. As a rule, violets are irregularly shaped flowers having five petals, the one in the middle below being spurred, the various kinds being of all sizes, with many forms of leaves, and not a few colors. Some have their dark-green leaves heart-shaped; some are palmate, and a few are lance-leaved.



BIRD FOOT VIOLET (4/9 nat. size)
B = bluish-violet

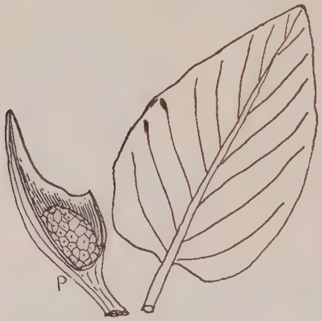
Now, our Bird-Foot Violet gets its name from the fact that its leaves have a fancied resemblance to the foot of a bird—which you will surely say is hard to see. However, the leaves are deeply split up into many segments, with some regularity and uniformity—a fact you will notice the first time you see one of these plants. The flowers are larger than those of any other wild violet, and examples of them an inch long are not difficult to find. It is a bluish-violet flower with a center of gold, and as a great rarity you will sometimes meet with white ones, as in the case with many other flowers. However, a permanent and abundant variety is the one that has the two upper petals of a dark, rich purple, the contrast being very striking and at the same time very beautiful. They grow in sandy or gravelly soil, and may often be found in the woods growing in a scattered way over a limited area, sometimes not over fifty feet in any direction; then you may walk for the rest of the day and not see any more of them.

When you come to examine one of these flowers still more closely, you will note that the lower or spurred petal is nearly white for its central half, grooved, and beautifully veined with fine little lines of violet—a very delicate addition to its beauty. Cross-fertilization is brought about by the aid of certain long-tongued insects, such as bumble-bees and small yellow and black butterflies, so well known to all of you in the summertime. Bird-Foot Violets have a way of almost entirely disappearing toward the end of summer and reappearing in the autumn, which is very lovely of them.

SKUNK CABBAGE

Spathyema fœtida (Linnæus) Rafinesque = *Symplocarpus fœtida* (Linnæus) Nuttall

ALMOST before the sun warms up the ground in the spring, you will find the Skunk Cabbages waking up down in the marsh-lands and along the muddy banks of streams. Few people like them, for they say the very smell of them makes them sick. You will forget that, though, when you begin to see how much there is of interest in one of these despised plants. You will remember, too, that the Skunk Cabbage is classed in the Arum Family, where we find the elegant Jack-in-the-pulpit, the Arrow Arum, Sweet Flag, and Golden Club, every one of which is a favorite with those who study flowers.



SKUNK CABBAGE (1/3 nat. size)
P = purple

Sometimes, even when there is snow on the ground and a little freezing has taken place over night, you will find the curved, beautifully colored spathes of the Skunk Cabbage peeping above the swampy soil of the marsh. See how very dark purple some of them are! Almost purplish black inside the "horn." Others are paler and striped with yellowish-green and rich purple. They remind you of a piece of raw meat, and a piece, at that, which has been kept too long! This odor, however, which is not altogether unlike a mixture of onions, spoiled beef, and the spray from an angry skunk, is one of the plant's truest servants, for it attracts flies and other insects from long distances. These, entering the open spathe, first here then there, succeed in cross-fertilizing the plant.

The true flowers are very small; but you will find them scattered over the big, fleshy spadix at the bottom of the shell-like spathe just described. Later on you will have a chance to study the ripe berries, and you must not miss that chance. As spring comes on, the beautiful leaves of the plant follow the spathes. How wonderfully handsome they are, as their pale-green, cone-shaped rolls push themselves up into sight and the sunlight, and how big the leaves are when spring is well along!

Did you ever try to pull a Skunk Cabbage up by the roots? No? Well, try it the next time you are down where they grow. You will think it is surely firmly anchored down below somewhere, and with a very heavy anchor at that. But should you succeed, you will find a tremendous root, made up of long, thickish stems, with sometimes a big, potato-like bulb in the middle, close up to the plant.

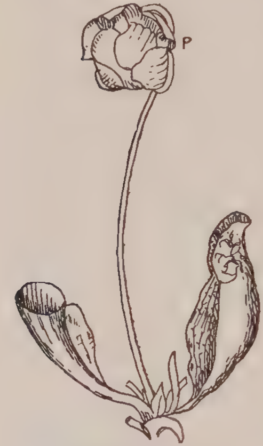
As in the case of our remarkable Pitcher Plant, we often find, later in the spring, some interesting insects inside the spathe, the poor things having gotten into the water collected there and drowned. Some one has said that the little Maryland Yellowthroat has been known to build its nest in the same place, and rear its young. So you see, it will repay you to look into these spathes from time to time, as the seasons come and go.

Pitcher Plant

Sarracenia purpurea Linnæus

Unless someone had already told you why the strange plants that you now have before you to study are called "pitcher plants," you would never in the world guess the reason. You might think that their beautiful flowers were shaped something like a pitcher, or that their roots or stems had something to do with the name; but neither of those answers would be the right one, though not so far off, for really it is their curiously shaped leaves that tell the story, as you will presently see. In some places these plants may be seen growing in plenty; while in others, where in times past they were common, none is now to be found. People pulled so many of them on account of their showy flowers and curious leaves; but you surely will not be so thoughtless, and you will try to stop others from being so whenever you can.

The places where Pitcher Plants grow are in boggy marshes, skirted by different kinds of trees, or under the shade of still other water-loving trees, as they grow in some big miry or mossy swamp. Where the plants are to be found, you will meet with them in all their glory, generally growing a few in one place, or single plants standing far apart from the others. The scene is one that you are not likely to forget; everything about the place is most beautiful, and is lovely in all kinds of weather.



PITCHER PLANT
(4/9 nat. size)
P = deep purple

Look at that single and perfect plant there! Is it not a wonder? Note that its big, nodding flower is fully two inches across, and of a deep purple color, sometimes with a reddish, pinkish, or even a greenish tinge. It blooms at the top of a stout, straight stem, which may be from one to two feet tall, and green in color. There are five sepals to the calyx, with a fewer number of bracts at its base. The petals lap over each other, and there are also five of them, while you will see that they overlap a dilation of the style, which latter is shaped like a little umbrella of a greenish-yellow color. It has five rays ending in five hooked stigmas, the number of stamens being indefinite.

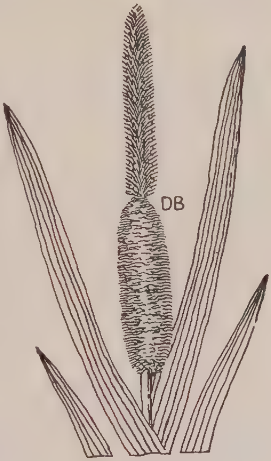
The curiously formed leaves, from four to ten inches long, are hollow and shaped like little trumpets, with the stem at the mouthpiece end, bending inward, to be attached to the base of the plant. There may be a dozen or more of these strange leaves, and they grow about the stem in a circle, with their open ends upward. Each perfect leaf is winged, and the whole is beautifully colored, being of various shades of green, streaked and lined with purple or dark liver color. Generally, each perfect leaf is nearly full of water, and in it you will find many different kinds of little insects for study. This plant grows in eastern United States, while there are several other kinds in the South, and a very curious relative on the Pacific coast.

CATTAILS

Typha sp.

WHERE Cattails grow, surely there is not a boy that does not know them; and as they are found in marshes all over the United States, we may well say that they are known everywhere. Still, there is a good deal about Cattails that you may not have thought of, and some things that not even grown people could tell you about, for they have never studied them.

First you should know that there are two kinds of Cattails. It is not very hard to tell them apart, for the leaves in one are very long and narrow, while the part you call the "tail" is much slimmer; and there are other differences. This kind we call the Narrow-leaved Cattail. If you pull a Cattail up, you will see that it has not hard stems with bark on like a bush, but only long, narrow, green leaves that wrap around each other below and above the root, but separate above. They are nearly always longer than the round, smooth stem that has the Cattail on.



CATTAIL
DB = dark brown

These leaves commence to show themselves very early in the spring, being very beautiful and green as they sprout up in the marsh among the old, dead Cattail leaves of the summer before. Along in August and September, when hundreds of other plants have bloomed and are gone, the fine big brown Cattails are seen waving in the wind among their long and narrow leaves. Still later, they swell and burst like pinches of yellowish cotton. This carries the seed, and are blown far and wide by the fall breezes, to land in other marshes and swamps, thus producing Cattails where there were none before.

Cattail flowers are very simple and of two kinds—the tail being made up of the seed-producing flowers, while the light-colored part above is of the other kind which, at the right season, supplies the pollen, and which, as you know, is needed by the seeds in that they may, when the time comes, sprout and grow. If you take a Cattail in the fall and tap on the stem below it, you will see that the pollen falls from the flowers of the spike above it, and dusts over the big brown part where the ovules are waiting to receive it.

This is very wonderful; for in most flowers the pollen reaches the seed-cells by the help of bees, butterflies, and other insects.

FERNS EVERY ONE SHOULD KNOW

By HENRY J. FRY

A FEW hours spent in the woods and along the roadsides of any locality will reveal half the ferns which grow there, since it is a very unusual neighborhood that has more than thirty species.

A fern "leaf" is called a *frond*. Those having *fruit dots* are *fertile fronds* while those without fruit dots are *sterile fronds*. These fruit dots are not seeds, like the seed of an apple, but each one is made up of many tiny spores. This is too complicated a subject to study here, and it can be referred to in "How to Know the Ferns," by Mrs. Dana, a book that every fern student should have, and also "Our Ferns in Their Haunts," by W. N. Clute.

Most ferns have the fruit dots scattered in one way or another over the under surface of the fertile fronds, and the fertile and sterile fronds are so much alike that they can be told apart only by turning them over to see which has the dots.

In contrast with these ferns there are some in which the sterile frond is perfectly fern-like, but the fertile frond is very different and hardly looks like a fern at all. It has no green "leaf" or blade, and is nothing but a stalk with many tiny berry-like fruit dots clustered about it.

Then there are a few ferns which are just half way between these two groups. Here the sterile frond is fern-like, and the larger part of the fertile frond is also fern-like, but there is just a small part of it which is dwarfed and condensed, and here are found the crowded fruit dots.

There are only a few technical words which must be understood in naming ferns. Thus far there have been *fruit dot, fertile frond*, and *sterile frond*. There are only three additional words, the first of which is *pinnate*. This has to do with how the fern is cut up into divisions, as the frond may be deeply cut into lobes. If these incisions reach the midrib dividing it into two rows of small branches along either side, like the leaf of the Sumach or Ash, it is then once-pinnate, that is, once-cut-into, and these branches are called *pinnæ*. If these pinnæ are themselves cut-into, dividing each one of them up into smaller branches, the frond is then twice-pinnate, and the divisions of the pinnæ are called *pinnules*. These pinnules may be still further sub-divided.

The important things to note, therefore, in naming a fern are: Where are the fruit dots? Are the fertile and sterile fronds alike? Is the frond cut-into once or twice, that is, once-pinnate or twice-pinnate? Where does it grow, in a wet or dry place? Is it dark or light green, delicate or leathery?

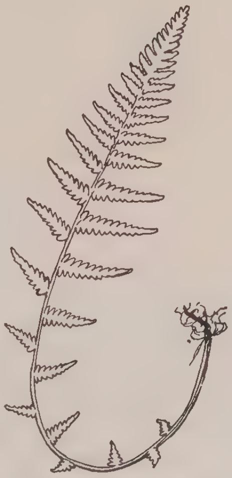
Many of the ferns have a special trait which always marks them from all others. These characteristics are pointed out in the following descriptions.

FERNS IN WHICH THE FERTILE AND STERILE FRONDS ARE ALIKE

New York Fern

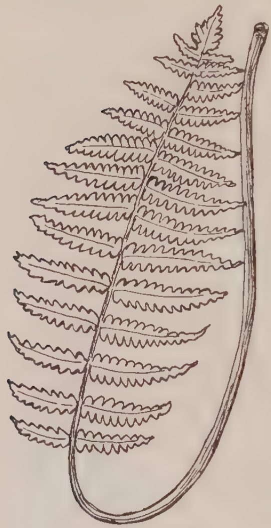
Dryopteris noveboracensis

A sure clue to the New York Fern is the marked manner in which the lower pairs of pinnæ rapidly become dwarfed until the lowest pair is no larger than two peas. The fronds are of an unusually light shade of green, quite delicate in appearance, although they are not quite cut into twice, that is, not quite twice-pinnate. They seldom grow over eighteen inches tall and



NEW YORK FERN

have a very short stem. The fruit dots are round, separate from each other, in two rows on each pinnule. The New York fern lives in dry woods and shady roadsides, often covering large areas in a scattered formation as it does not grow in clumps. It is at its best in early summer.



MARSH FERN

Marsh Fern or Marsh Shield-Fern

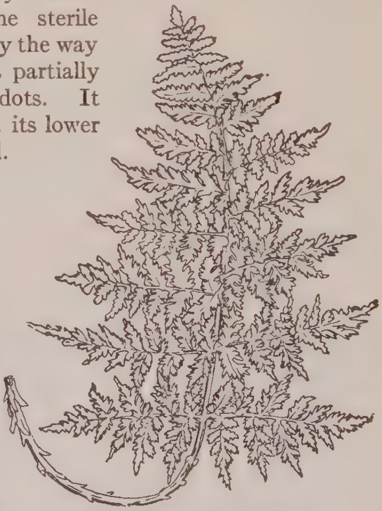
Dryopteris thelypteris

The Marsh Fern can always be named by its remarkably long stalk which holds the comparatively short "leaf" up in the light among the surrounding marsh grasses. Only rarely is it found in a dry place. Like the New York, its growth is scattered and not in clusters. The fruit dots are found in two rows on the pinnules of its twice-pinnate fronds in late summer. The fertile fronds can easily be told from the sterile fronds by the way in which the edges of the pinnules partially turn under to protect the fruit dots. It looks most like the New York, but its lower pinnæ are broad and not contracted.

Spinulose Wood Fern, or American Shield-Fern

Dryopteris spinulosa var. *intermedia*

The Spinulose Wood Fern can be distinguished from all others by the peculiar triangular shape of its lowest pinnæ, where the down-pointing pinnules are twice as long as the upward-pointing pinnules. It is the most common of the ferns found in damp, rocky



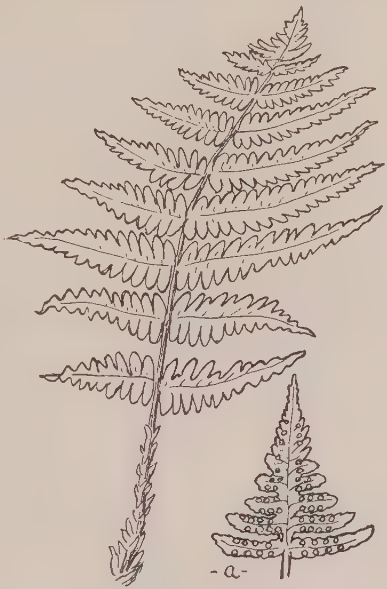
SPINULOSE WOOD FERN

woods. Its lacy fronds, which are almost three times pinnate, grow in clusters. At the base of each stem are small brown scales each having a dark center. The fruit dots are round, separate from each other and irregularly scattered. Though there are many varieties as to form and size, which varies from one to three feet, the triangular lower pinnæ are always its trade-mark.

Evergreen Wood Fern

Dryopteris marginalis

The Evergreen Wood Fern is found near the Spinulose in the same localities, also growing in circular clusters of about the same height. It is very leathery, however, and not nearly so much cut-into. It is of a smoother appearance, has a darker shade of green, and keeps evergreen in the snow throughout the winter. It also has chaffy lower stalks. Its chief characteristic, by which its friends always know it, is the careful arrangement in an even line, *about the edge of each pinnule*, of the large, regularly separated fruit dots. It is this trait which gives it its scientific name.

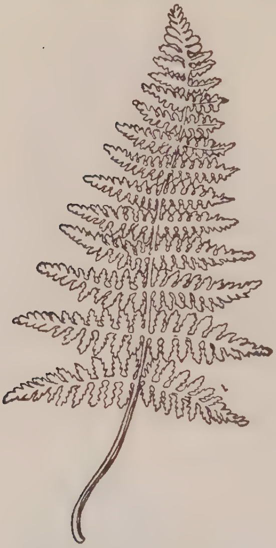


EVERGREEN WOOD FERN
a = tip of fertile pinna

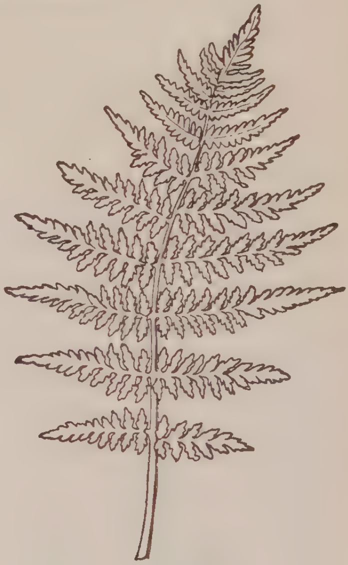
Hay-scented Fern

Dicksonia punctilobula

The Hay-scented Fern is one of the most abundant of all the ferns and is easily confused with others. Few others, however, grow in such large, dense masses, especially about rocks and bowlders in open sunny fields and roadsides. The fronds are unusually thin, of a very light-green shade, and their lace-like appearance is due to the fact that they are almost three times pinnate. They are very narrow and steeple-like in form, growing from two to three feet tall. The tiny round fruit dots are separate from each other, each on a small elevation and each protected by a slightly recurved toothlet of the pinnule. The delicate fragrance of this species gives it its name. It is distinguished from the Lady Fern by the latter's oblong or curved fruit dots, from Spinulose by the latter's triangular lower pinnæ, from the New York by the latter's tiny lower pinnæ, and from the Marsh by the latter's very long stem.



HAY-SCENTED FERN



LADY FERN

Lady Fern

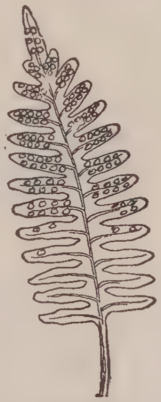
Asplenium filix-fœmina

The Lady Fern is another common species often difficult to name. It may make its home anywhere, from the damp, shady bank of a woodland stream to a sunny, dusty roadside, and its shape and appearance vary as much as its place of growth. It may be fragile and delicate or coarse and leathery, ranging in height from one to three feet. The fruit dots are oblong, but are often curved or crescent-shaped, being arranged in two rows on each pinnule. The frond is twice-pinnate, the pinnules having tiny teeth. It is most easily confused with the Hay-scented, but it never has round fruit dots, it is not so narrowly shaped, it is a darker green, and the veins are insunk on the upper surface.

Common Polypody

Polypodium vulgare

When ferns about nine inches long are found growing in a dense mat on rocks they are probably the Polypody. This is one of the few ferns which are almost but not quite once-pinnate, since the deep incisions fail to reach the midrib. It has exceedingly large, round fruit dots on the under side of the upper two-thirds of the fertile fronds. It is a thick and sturdy species, persisting through the winter.

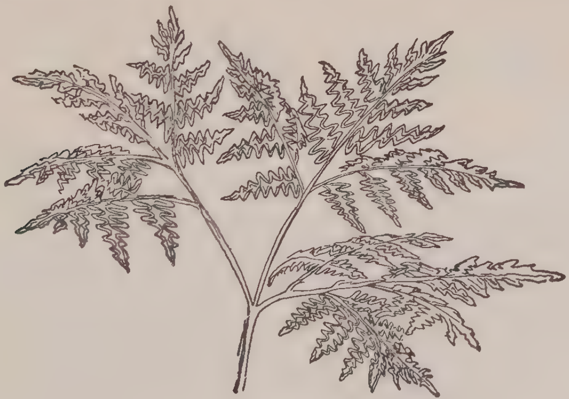


COMMON POLYPODY

Brake

Pteris aquilina

The "leaf" of the Brake is held almost parallel with the ground, like an umbrella, which is quite unusual, as most ferns grow straight up in the air. The fronds are dark green, heavy, and leathery, varying in height from one to four feet. They often cover large sunny areas in dry localities, each one rising singly. The fronds, which are triangular in shape, are divided into three main divisions, each of which is pinnatifid once or twice. An absolutely unmistakable ear-mark is the location of the fruit dots in a

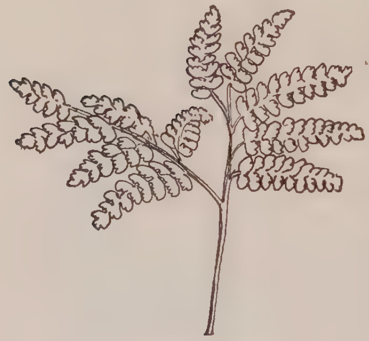


BRAKE

continuous brown line along the under margin of each pinnule, the edge of which is turned under to protect them.

Maidenhair Fern

Adiantum pedatum



MAIDENHAIR FERN

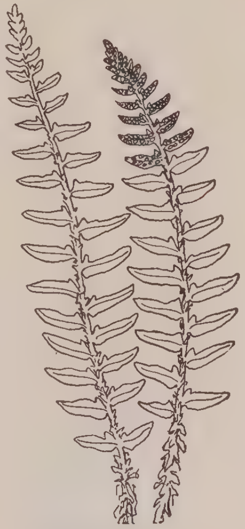
The shining ebony stem of the Maidenhair splits into two forks near its summit, each of which forms a short half-circle parallel with the ground, and from these two half-circles grow out the pinnæ, which are again divided into delicate pinnules. The green portion of the frond is thus held in a horizontal position, the tips of the pinnæ drooping downward. No other American fern has a frond arrangement of such exquisite beauty. The fruit dots are underneath the turned-over tips of the pinnules, somewhat like the Brake, though not in a continuous line. The Maidenhair grows about a foot high in colonies in damp woods.

FERNS IN WHICH THE STERILE FROND AND THE LARGER PART OF THE FERTILE FROND ARE ALIKE, BUT A PORTION OF THE FERTILE FROND IS UNLIKE THE REST

Christmas Fern

Dryopteris acrostichoides

The Christmas Fern is just exactly once-pinnate; that is, the fronds are cut up into pinnæ, and these are not further divided. There is a characteristic ear-like lobe at the base of each pinna. The fertile fronds have the fruit dots massed in brown patches on the under surface of their upper half. This causes a marked constriction of the upper part, so that the fertile fronds can be told at a glance from the sterile ones, as the former are broad below and narrow above, while the latter are alike throughout. The sterile ones are also shorter. The Christmas Fern grows to a height of two feet in rocky woods. It has very shiny, dark green, leathery fronds which remain green all through the year. It calls to mind the cultivated "Boston" Fern.

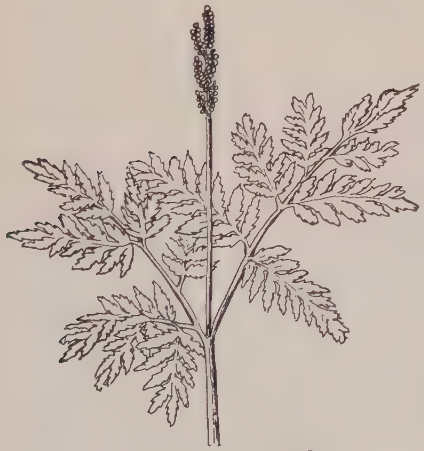


CHRISTMAS FERN

RATTLESNAKE, OR VIRGINIA GRAPE, FERN

Botrychium virginianum

IN THE Rattlesnake Fern the fertile frond is divided into two strikingly different regions. The larger portion, which is the green blade or "leaf," is in three main divisions, which are a very light shade of green, and are unusually lacy. The other portion of the fertile frond is a stalk rising from the midst of the blade having a cluster of tiny berry-like capsules, containing the spores, at its tip. The sterile fronds are exactly like the fertile fronds without the spore-bearing portion. In both kinds of fronds the "leaf" is so held that it is parallel with the ground, somewhat like the Brake and Maidenhair. It is found in early summer in damp, shady woods, varying in height from a few inches to two feet.

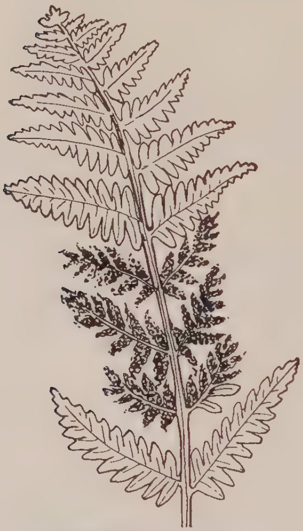


RATTLESNAKE FERN

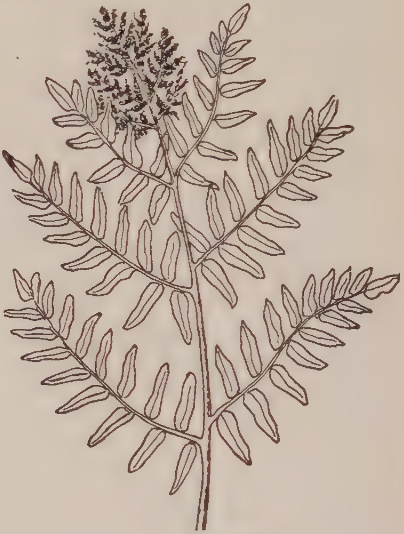
INTERRUPTED FERN

Osmunda claytoniana

THE Interrupted Fern lives up to its name, since several pairs of pinnæ in the middle of the fertile frond are seemingly blasted, brown, and shriveled, interrupting the outline of the otherwise broad, green frond. These seemingly dead pinnæ, however, are that part of the fertile frond which bears the clusters of tiny round fruiting bodies, just like the similar part of the Rattlesnake Fern. The sterile fronds are like the fertile, but have no interruption by dwarfed, spore-bearing pinnæ, and they are a little shorter. The fronds are almost twice-pinnate, rising from two to five feet in a circular formation. Sterile fronds of the Interrupted can be distinguished from sterile fronds of the Cinnamon by the presence of tufts of brown cotton-like material at the base of the pinnæ in the latter. The Interrupted lives in dry places, while the Cinnamon loves wet locations.



INTERRUPTED FERN



ROYAL FERN

ROYAL FERN

Osmunda regalis

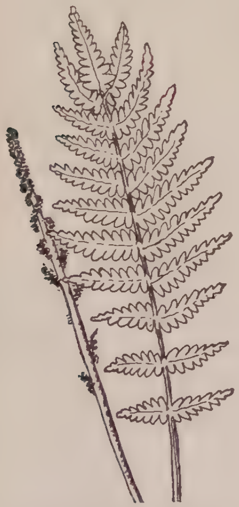
THE Royal Fern grows in swampy regions in masses often covering large areas. It is a large fern, rising from three to five feet in height. The fronds are cut up into very large, widely separated pinnæ, each of which is again cut up into large, smooth-edged, widely separated pinnules in a manner that can be confused with no other fern. The greater portion of the fertile frond is exactly like the sterile except its tip, which alone bears brown berry-like clusters of fruiting bodies during the early summer. This tip is so contracted and seemingly withered as to be strikingly different from the lower part of the frond, which is a sure way of identifying the Royal.

FERNS IN WHICH THE STERILE FRONDS ARE UNLIKE

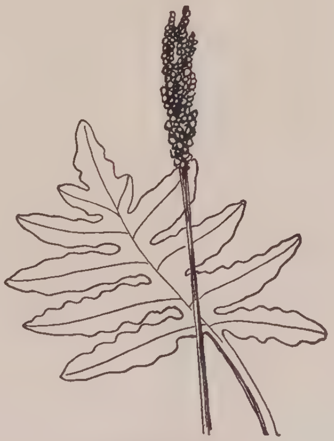
Cinnamon Fern

Osmunda cinnamomea

The Cinnamon Fern is another dweller in wet places. Like the Interrupted, the sterile fronds are almost twice pinnate, are from two to five feet tall, and grow in a circular formation. Cinnamon colored tufts of cotton-like substance at the base of each pinna and along the bottom of the stalk, mark this fern. The entire fertile frond is completely different from the sterile frond, since along its entire length it is contracted into what appears to be a stem with dead, brown pinnæ clinging to it.



CINNAMON FERN



SENSITIVE FERN

In June these fronds rise from the center of the circle of sterile fronds like brown wands, but soon after they are found lying prostrate among the sturdier sterile ones.

SENSITIVE FERN

Onoclea sensibilis

THE Sensitive Fern is found at its best along streams and in wet meadows. The sterile fronds can be confused with no other species, as they are broadly triangular, being deeply cut into ribbon-like divisions with wavy edges. These incisions do not quite reach the midrib, thus the fronds are not quite once-pinnate. The fertile fronds, which occur less frequently, are completely unlike the sterile ones and are hardly recognizable as ferns. Somewhat like the Cinnamon, in place of the usual green "leaf," rows of tiny green balls containing the fruiting bodies are clustered near the tip of a stalk. The fertile fronds of this season are green, while the brown husks of last year's may be found standing among the others.

KNOWING THE TREES

By JOSEPH S. ILLICK

I love thee when thy swelling buds appear,
And one by one their tender leaves unfold,
As if they knew that warmer suns were near,
Nor longer sought to hide from winter's cold;
And when with darker growth thy leaves are seen
To veil from view the early robin's nest,
I love to lie beneath thy waving screen,
With limbs by summer's heat and toil oppressed;

And when the autumn winds have stripped thee bare,
And round thee lies the smooth, untrodden snow,
When naught is thine that made thee once so fair,
I love to watch thy shadowy form below,
And through thy leafless arms to look above
On stars that brighter beam when most we need their care.
—JONES VERY

FOREWORD

TREES are among the commonest and most conspicuous objects of nature. Next to the grasses, which comprise about 3,000 distinct species, trees are the most widely distributed and best known members of the whole vegetable kingdom. They are found in every land, and occur in a great variety of situations. As vanguards of the forest they stand on the shores of the ocean, battling with the mighty waves and compelling winds. They stand as outposts along the border of dreary deserts, and contend with the destructive forces of nature along the timber line on our high mountain slopes. They beautify the banks of placid streams, and protect their shores against raging torrents. They frame the home picture, and give thereto an expression of homeliness and comfort. They furnish a protective cover to steep mountain slopes, and thus help in the checking of erosion and in the prevention of destructive floods.

Furthermore, they yield many of the most essential and indispensable commodities which man uses in time of peace and in waging war. A prominent military authority stated that the planted forests of France were a powerful factor in checking, and finally stopping, the German offensive in the recent world war. Many military units sought shelter in dense forest stands, and used the branches of trees to camouflage batteries, and employed every piece of available timber in constructive work. The forest played an important part in both the offensive and defensive operations of the army, and its products played an even greater rôle during the reconstruction period, for thousands of homes and other essential structures have been built.

Wood will forever be a human need. We cannot get along without it. It is an essential from the cradle to the coffin. But unfortunately our available supply is waning rapidly, and something must be done to offset this destructive tendency. It is imperative that we begin immediately to build up our forests with valuable trees, and thus offset the destructive work of the wasteful lumbering methods of the past.

The first and most essential step in this building-up process is the protection of all existing growth from destructive agencies. Forest fires have been the curse of our forests ever since the days of the early pioneer. Fire usually followed in the wake of lumbering operations, and left areas of desolation where once stood matchless miles of untouched primeval timber.

The original forest of North America covered an aggregate area of 850,000,000 acres, consisting chiefly of dense and very productive stands. Our present forests are small, open, and very unproductive. Each generation of mankind has seen a smaller, more open, and less productive generation of forests. It is not a prophecy, but the statement of a fact, when we say that the source of our timber supply is becoming a real vital economic question. Fast-vanishing forests and ever-rising lumber prices are couriers of this fact.

These extensive stretches of unproductive land cannot remain. It is an economic crime to allow thousands of acres of land capable of producing valuable and much-needed forests to remain idle. They must be restocked with valuable forest trees. Nature will do much in restoring forests, upon devastated areas, but its methods are uncertain, and its work, as a rule, progresses slowly. Man is capable of giving much assistance to nature by directing its forces and supplementing them wherever they are too weak.

The planting of trees is one of the most practical and economical methods of helping nature. The first quarter of the twentieth century will go down in the annals of American forestry as the "Age of Forest Tree Planting." Forest trees are now being planted everywhere for a great many purposes. They are being set out as fitting and lasting memorials to those who made "the supreme sacrifice" in the recent world war. One can find them along streets, highways, waterways, and by-ways, in parks and playgrounds, on lawns and estates, and within privately and publicly owned forests. Many communities have developed Roads of Remembrance, established Memorial Parks, and set out Tribute and Memorial Trees. Thousands of trees are planted annually to reforest watersheds, barren mountain slopes and vacant corners. During the past twenty years fifty million forest trees have been planted within the State of Pennsylvania, and an increasing number will be set out in the future.

Our friendship with trees is at first passive, but upon learning their interesting habits, unique behaviors, and many uses more fully, the friendship develops into a passionate love of them. As one becomes acquainted with them he soon finds that they differ from each other just as each human being differs from all others, and yet there are types and families of trees just as there are nations and races among men.

There are more than 500 different species of trees native to North America, but less than 100 of them can be classified as important timber trees. Some of them are being used extensively for ornamental planting, and a few are propagated for the fruit which they yield.

There follows a description and discussion of eighty common trees, and in the comparative discussions of distinguishing characteristics at least fifty additional kinds are considered. If one learns to know these representative trees, little difficulty should be experienced in identifying all the important groups of American trees, and the knowledge acquired will be of much value in making homes more beautiful, towns more attractive, and States more productive.

Let every American boy and his father *plant trees*, *plant love for trees*, and *plant knowledge concerning trees!* All three are commendable practices, but the greatest of them is knowledge concerning trees, for he who really knows them will likely plant them and love them too.

Unless otherwise credited, the sketches of trees in the following pages are from "Trees of Pennsylvania."

He who plants a tree
Plants a joy;
Plants a comfort that will never cloy.
Every day a fresh reality
Beautiful and strong,
To whose shelter throng
Creatures blithe with song.
If thou couldst but know, thou happy tree,
Of the bliss that shall inhabit thee!

He who plants a tree
He plants love.
Tents of coolness spreading out above
Wayfarers he may not live to see.
Gifts that grow are best;
Hands that bless are blest;
Plant: Life does the rest!
Heaven and earth help him who plants a tree,
And his work its own reward shall be.

—LUCY LARCOM.

THE PINE FAMILY

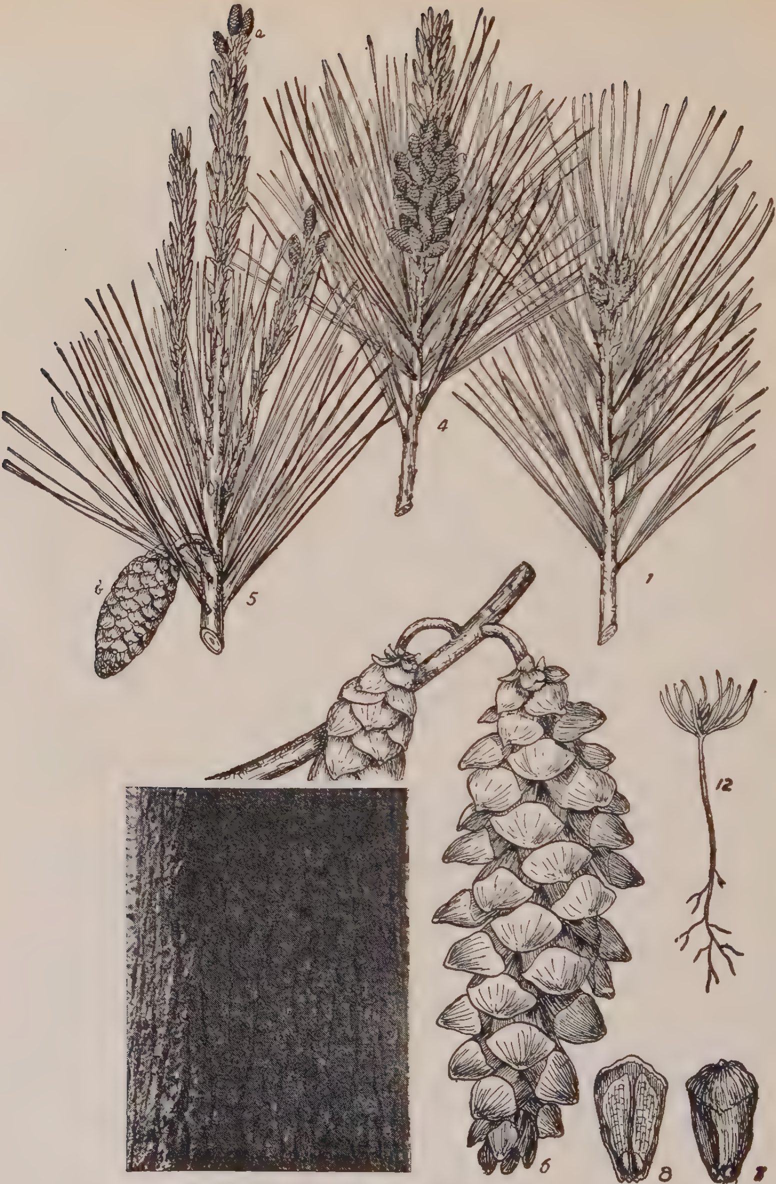
PINACEÆ

THE Pine Family comprises thirty-four different groups of trees and shrubs with a total membership of about 300 distinct species. All the members of this family are collectively known as conifers. The evergreen habit is characteristic of most of them, the Larches and the Bald Cypresses being the only native groups which are entirely devoid of foliage during the winter months.

The Pine Family is of special economic importance on account of the many commercial products which are derived from it, and the wide range of characteristics and habits which its members possess. Their leaves are usually awl-shaped, scale-shaped, or needle-like, and their fruit is a woody cone, ranging in size from that of a small cherry to a football. The wood of its members differs markedly from that of broad-leaved trees in its great uniformity, less conspicuous figure, and absence of pores. Some representatives yield large quantities of resin, tar, pitch, and turpentine, all of which are important articles of commerce.

The principal North American groups of trees belonging to the Pine Family are:

Common Name	Scientific Name
1. The Pines.	Pinus.
2. The Larches.	Larix.
3. The Spruces.	Picea.
4. The False Firs.	Pseudotsuga.
5. The True Firs.	Abies.



WHITE PINE

6. The Hemlocks.	Tsuga.
7. The Arbor Vitæs.	Thuya.
8. The Cedars.	Chamaecyparis.
9. The Sequoias.	Sequoia.
10. The Bald Cypresses.	Taxodium.
11. The Incense Cedars.	Heyderia.
12. The Junipers.	Juniperus.

WHITE PINE

PINUS STROBUS *Linnæus*

FAMILY.—Pine.

OTHER NAME.—Soft Pine.

GENERAL DESCRIPTION.—*Shape:* pyramidal to conical; in dense stands, crowns shallow and broad. *Height:* 50 to 90, sometimes 125 feet. *Bark:* on old trunks thick, dark gray, deeply furrowed; on young trunks thin, smooth, greenish-brown. *Buds:* egg-shaped, sharp-pointed, ¼ of an inch long, clustered at the end of twigs. *Leaves:* bluish-green, soft, flexible, needle-like, about 5 inches long, occur *in clusters of five*. *Flowers:* appear about May; pollen-bearing, yellow, oval, about ¼ of an inch long; seed-bearing, pinkish-purple, cylindrical, about 1/3 of an inch long. *Fruit:* a drooping and short-stalked cone 5 to 8 inches long.

PREFERRED HABITAT.—Moist, fertile, and well-drained soil.

RANGE.—Newfoundland to Manitoba, south through Pennsylvania to Georgia, and southwest to Iowa.

THE White Pine may be recognized without much effort. It is the only evergreen tree native to eastern North America which has its soft, flexible and bluish-green needles arranged *in clusters of five*. The lateral branches are arranged in distinct horizontal layers, from three to seven of them occurring in a whorl. After the branches fall off they leave distinct circles of branch traces along the trunks. The cones are 5 to 10 inches long, bear a short stalk, and are covered with thin, flat, and unarmed scales.

The wood is soft, straight-grained, and works easily. It weighs about 25 pounds per cubic foot, and was formerly used for a wider range of purposes than any other American wood.

Only a few tracts of virgin White Pine remain in the world. A trip to these remaining samples of nature's supreme accomplishment in tree development is well worth while, for the pleasure derived from looking at these monarchs of the forest is indescribable.

The White Pine is the most important forest tree in eastern North America, and probably in the world. It adapts itself to a great variety of soils, grows rapidly, produces valuable wood, and is ornamental.

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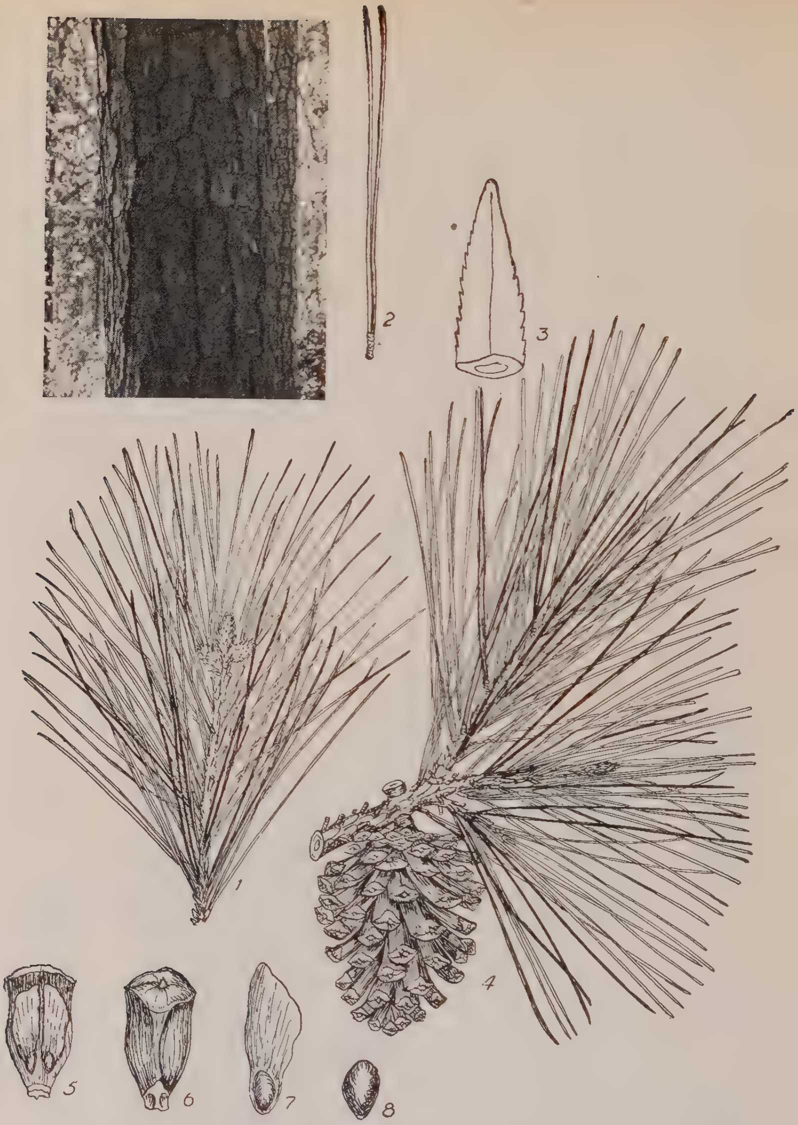
1 = Branch with needles and terminal cluster of buds; 4 = branch with staminate flowers; 5 = branch with (a) pistillate flowers on new growth, (b) one-year-old cone on last season's growth; 6 = branches with an open cone; 7 = lower side of a cone scale; 8 = upper side of a cone scale with two winged seeds; 12 = a seedling



SHORT-LEAF PINE

1 = Branch with needles and terminal cluster of buds; 2 = a cluster of two needles; 3 = tip of a needle with finely serrate margin, enlarged, 4 = branch with needles and an open cone; 5 = upper side of a cone scale with two winged seeds; 6 = lower side of a cone scale; 7 = a winged seed, natural size; 8 = a seed, slightly enlarged

SHORT-LEAF PINE

PINUS ECHINATA *Miller*

FAMILY.—Pine.

OTHER NAMES.—Yellow Pine; Rosemary Pine; North Carolina Pine; Pitch Pine.

GENERAL DESCRIPTION.—*Shape:* tall, clean, slightly tapering trunk bearing a shallow, broad, round-topped crown. *Height:* 80 to 100, sometimes 120 feet. *Bark:* on old trunks dark brown, tinged with cinnamon red, thick, broken by furrows forming rectangular scaly plates. *Leaves:* needle-like, slender. flexible, dark bluish-green, 3 to 4 inches long; arranged in clusters of two, sometimes three. *Flowers:* appear during April and May; pollen-bearing, pale purple to yellow, oval, about ¼ of an inch long; seed-bearing, pale rose-colored, cylindrical, 1/3 of an inch long. *Fruit:* a short-stalked or sessile egg-shaped cone, 1½ to 2½ inches long.

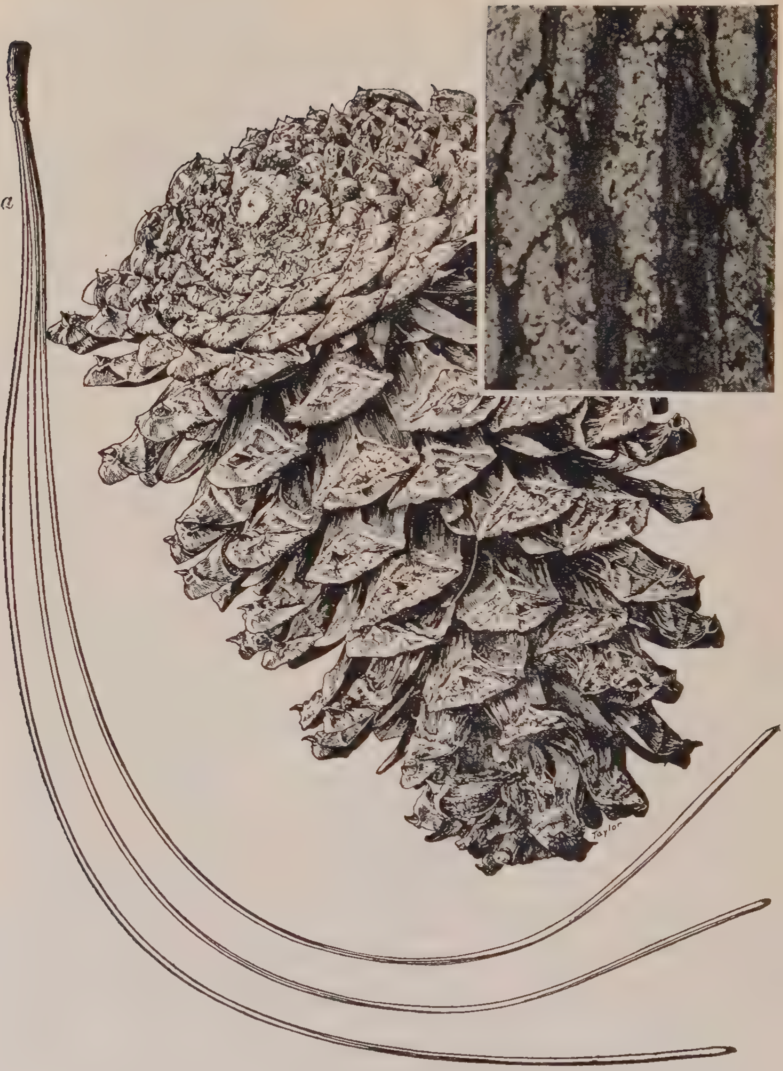
PREFERRED HABITAT.—Plains and foothills. Common on poor, sandy, and clayey soil.

RANGE.—Southeastern New York and northern Pennsylvania to Florida, Illinois, Kansas, and Texas.

THE Short-leaf Pine has the widest distribution of the thirty-four different pines native to North America. Its botanical range covers more than 440,000 square miles, and in at least two-thirds of this area it is of commercial importance. It extends from sea level to an altitude of 3,000 feet in the Southern Appalachians, but reaches its best development on the plains and foothills between 400 and 1,500 feet.

This tree has at least a dozen local common names. The name Short-leaf Pine, however, fits it best, for its leaves are indeed short and slender. They are 3 to 5 inches long, and that is very short in comparison with those of the Long-leaf Pine, which vary in length from 12 to 18 inches. As a rule, two needles occur in a cluster, but occasionally one may find three or even four in a bundle. Its clean, stately, and slightly tapering trunk, the bark of which is marked off by deep furrows into irregular or rectangular plates covered with thin scales, is a very positive means of identification. The cones are conical in shape when closed, and bear numerous brown scales, terminated by weak prickles. They are about 2 inches long, persist for two or more years, and yield a large quantity of seed. A pound of seed comprises 50,000 to 65,000 separate seeds, which should produce about 30,000 seedlings, if planted carefully and tended properly in a nursery.

It grows fairly rapidly, is easily propagated, thrives on a wide range of soils, endures extreme climatic conditions, and yields valuable timber and naval stores. Turpentine, rosin, charcoal, tar, and pine oil are some of the important by-products derived from this tree. Much of our strong wrapping paper is also manufactured from paper pulp derived from it.



Courtesy of U. S. Forest Service

WESTERN YELLOW PINE
a = Leaf

WESTERN YELLOW PINE

PINUS PONDEROSA *Lawson*

FAMILY.—Pine.

OTHER NAMES.—Yellow Pine; Bull Pine.

GENERAL DESCRIPTION.—*Shape:* massive, straight-trunked tree bearing a long narrow crown. *Height:* 125 to 140, sometimes 200 feet, with a diameter from 3 to 8 feet. *Age:* 300 to 500 years *Bark:* on old trunks thick, russet-red, marked by broad shield-like plates, covered with concave scales. *Leaves:* needle-like, deep yellow-green, 5 to 11 inches long, occur in bundles of 3. *Flowers:* appear about May; pollen-bearing clustered at base of new growth, and seed-bearing occur in small groups along new growth. *Fruit:* a grass-green to purple cone, 3 to 6 inches long, 1½ to 2 inches wide, covered with russet-brown and shiny cone scales.

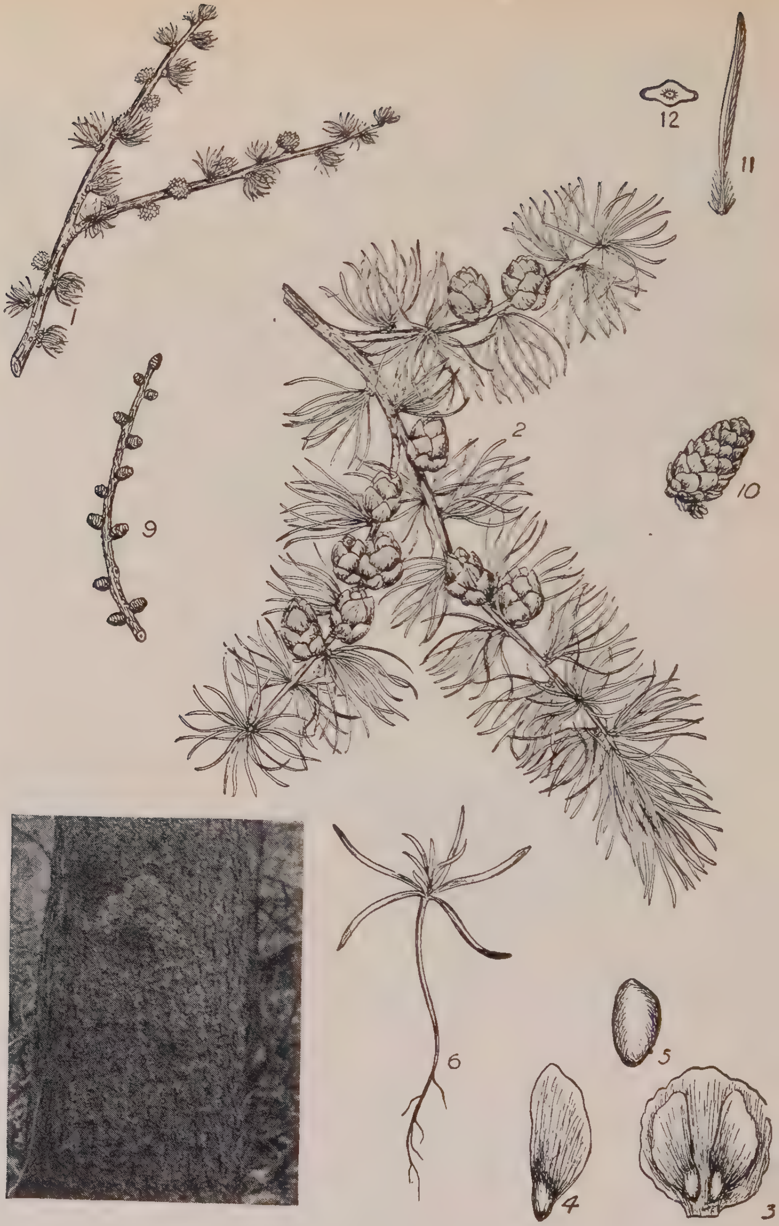
PREFERRED HABITAT.—Dry, well-drained, sandy, or gravelly soils.

RANGE.—Dakotas northwest to the Canadian line, south to Lower California and New Mexico, and along the mountains to Central Mexico.

THE Western Yellow Pine has the widest distribution of the twenty-four different kinds of pine native to the western part of the United States. It has no less than fourteen common names, and to call it Western Yellow Pine is in entire harmony with its range and characteristics. The specific part of its scientific name—ponderosa—is eminently fitting, for it is indeed a ponderous tree, being surpassed in size only by the majestic Sugar Pine. Exceptionally large trees reach a height of 175 to 200 feet, and attain an age of 350 to 500 years.

This tree has such striking characteristics that it can be recognized easily at all seasons of the year. The trunk is massive and straight, and bears a narrow conical crown composed of huge bent branches. The needles are 4 to 11 inches long and occur three in a bundle. The branches are stout, stiff, and if broken, give off a strong odor of orange. The cones vary in length from 3 to 6 inches, mature early in August of the second season, and range in color from greenish to dark purple.

It is botanically classified as a Hard Pine, but its wood is intermediate between that of the White Pines and the Hard Pines of the South. The wood is rather heavy, hard, and strong It weighs about 30 pounds per cubic foot, and is used for heavy construction work, railroad ties, telegraph poles, mine timbers, and other similar uses.



AMERICAN LARCH

AMERICAN LARCH

LARIX LARICINA (*Du Roi*) *Koch*

FAMILY.—Pine.

OTHER NAMES.—Larch; Tamarack; Hackmatack; Black Larch.

GENERAL DESCRIPTION.—*Shape:* conical to pyramidal. *Height:* 30 to 40, sometimes 90 feet. *Bark:* on branches smooth, thin, bluish-gray; on old trunks close-fitting, roughened by small, thin, roundish, reddish-brown scales. *Twigs:* slender, dull brown, covered with numerous, short, stout, spur-like lateral branches. *Buds:* small, smooth, shiny, round, about 2/5 of an inch across, occur at end of spur-like lateral branches. *Leaves:* needle-like, ¾ to 1½ inch long, persist only during one season; occur singly on terminal shoots, and are clustered on lateral spurs of branches. *Flowers:* appear about May; pollen-bearing, stalkless, yellow, and almost round; seed-bearing, short-stalked, reddish and oblong. *Fruit:* an egg-shaped light brown cone, about 2/5 of an inch long, and composed of approximately 12 scales.

PREFERRED HABITAT.—Cold swamps and wet places.

RANGE.—A transcontinental species extending from Newfoundland south to Pennsylvania, and west through Minnesota and British Columbia to Alaska.

THE American Larch stands out prominently among its associates because it sheds all its leaves each autumn. On the approach of winter the leaves become pale yellow and fall to the ground.

The leaves of the American Larch are flat, soft, slender, and about one inch long. On the twigs of the last season they occur singly, while on the spurs of older twigs they are found in dense clusters of ten or more.

The cones are among the smallest produced by any American conifer. They average only about 2/5 of an inch in length and bear approximately twelve scales, upon which the tiny winged seeds are produced. The mature cones often persist upon the trees for many years.

In winter the glossy brown twigs, entirely devoid of any foliage and covered with numerous stubby lateral spurs, are positive means of identification. The characteristic reddish-brown bark on the older trunks, often broken up into small roundish scales, is also very characteristic.

The American Larch is the only tree which occurs from Newfoundland across the entire continent to Alaska, and extends beyond the Arctic Circle to the limit of tree growth. Throughout this wide range it meets with a great diversity of climatic conditions, and each varied habitat seems to stamp it with some peculiarity. It prefers cold bogs, swamps, and other wet places, but also thrives on well-drained hillsides.

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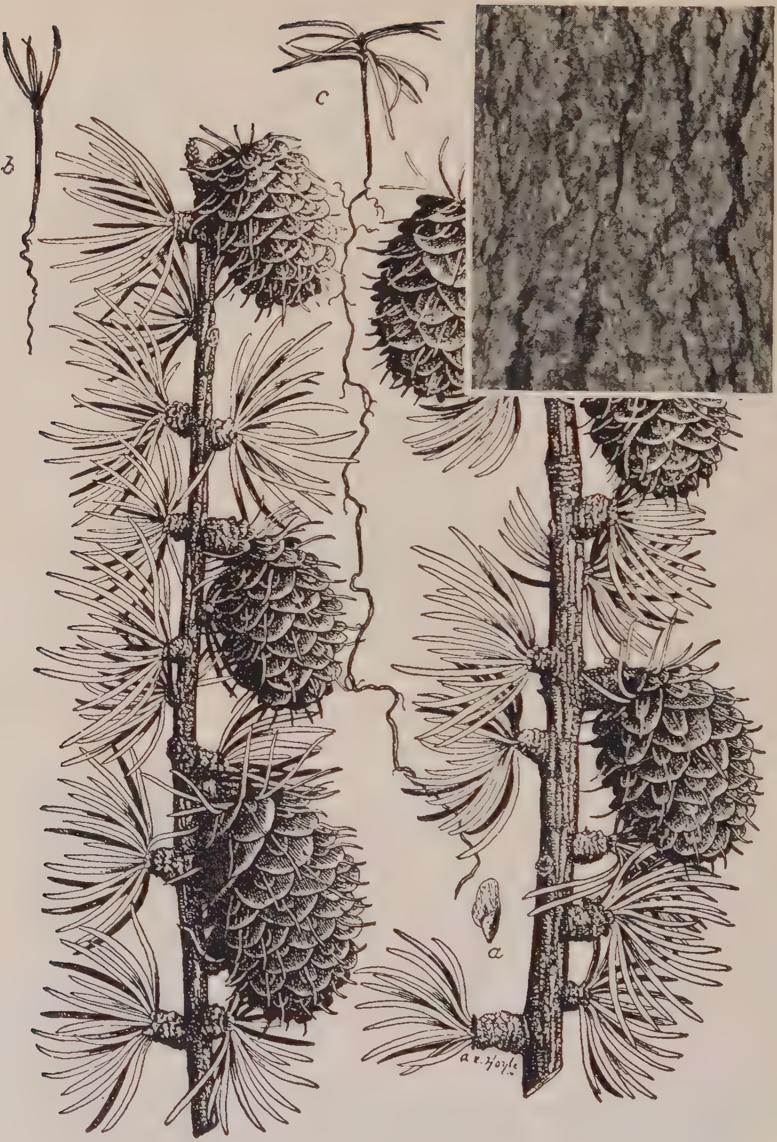
1 = Branch with developing leaves and flowers; 2 = branch with needles (clustered and solitary) and fruit; 3 = cone scale with two winged seeds, enlarged; 4 = a winged seed, enlarged; 5 = a seed, enlarged; 6 = a seedling, enlarged; 9 = a winter branch with lateral spurs; 10 = a cone of European Larch (*Larix decidua*); 11 = leaf of European Larch; 12 = cross-section of European Larch, enlarged

Courtesy of U. S. Forest Service



WESTERN LARCH

a = Upper side of seed with wing; b = seedling two weeks old; c = seedling six weeks old

WESTERN LARCH

LARIX OCCIDENTALIS *Nuttall*

FAMILY.—Pine.

OTHER NAMES.—Western Tamarack; Tamarack; Red American Larch.

GENERAL DESCRIPTION.—*Shape:* crown narrow, short, pyramid-like, running up to slender point. *Height:* 100 to 180, sometimes 200 feet, with a diameter of 5 to 8 feet. *Bark:* reddish cinnamon-brown, 3 to 6 inches thick, deeply furrowed. *Leaves:* flatly triangular, 1 to 2 inches long, occur solitary on new growth, and in clusters of 14 to 30 needles on older twigs. *Fruit:* a cone 1 to 1 ½ inch long, matures in one year, falls by October or November.

PREFERRED HABITAT.—North and west exposures, stream bottoms, valleys, and flats.

RANGE.—Southeastern British Columbia, northwestern Montana, northern Idaho, Washington and southward to Oregon.

THE Western Larch is a tree of far greater economic importance than the Eastern Larch, in spite of its restricted range. It is seldom found less than 2,000 or more than 7,000 feet above sea level, and within this altitude occurs on a wide range of situations, from wet ground to dry mountain sides.

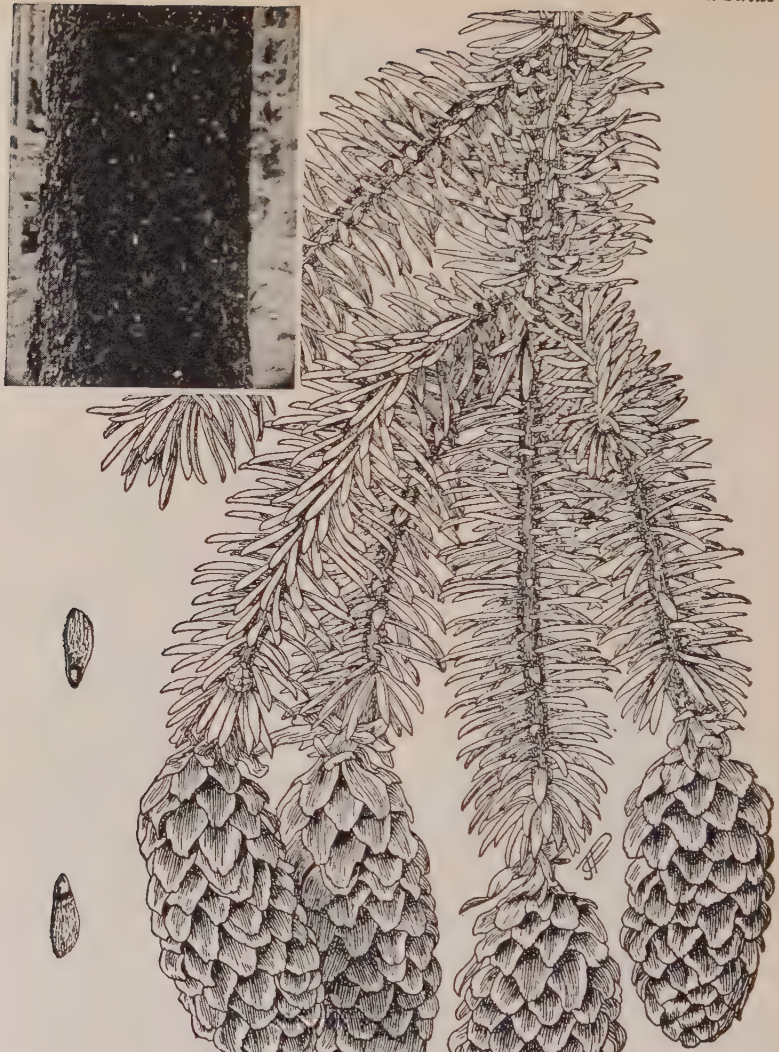
That it is a larch, is its best distinguishing characteristic. This means that it sheds all its leaves each autumn, and that the leaves, which are a trifle longer than those of the Eastern Larch, occur singly on the twigs of the last season's growth and in dense clusters on the older growth.

While the bark of the Eastern Larch is thin, that of mature specimens of Western Larch is often 4 to 6 inches thick and deeply furrowed. The cones of the Western Larch are 1 to 1¼ inch long, while those of the Eastern Larch rarely exceed 2/5 of an inch in length, and are covered with a coat of white woolly hairs.

The Western Larch is one of the big trees of the West, for it frequently exceeds 150 feet in height and occasionally reaches 200 feet. It is the largest and most massive of the North American Larches.

It belongs to the group of long-lived trees, for it ordinarily reaches an age of 300–500 years, and some of the larger specimens are probably 600 to 700 years old.

Courtesy of U. S. Forest Service



AIRPLANE SPRUCE

AIRPLANE SPRUCE

PICEA SITCHENSIS *Carriere*

FAMILY.—Pine.

OTHER NAMES.—Sitka Spruce; Tideland Spruce; Western Spruce; Giant Spruce; Alaska Spruce; Silver Spruce.

GENERAL DESCRIPTION.—*Shape:* conical and narrow topped. *Height:* 125 to 150, sometimes 270 feet, with an occasional diameter of 15 feet. *Bark:* reddish-brown in color, up to 1 inch thick, broken into thin, irregular, loose, round scales. *Leaves:* straight stiff, flat, ¼ to ½ of an inch long, blunt-pointed, stand out in all directions from twigs. *Flowers:* pollen-bearing, darkish red, cylindrical in form, seed-bearing, about 1 inch long, oblong in form. *Fruit:* a shiny reddish-brown cone from 2 to 4 inches long.

PREFERRED HABITAT.—Swampy or moist land and mild climate.

RANGE.—Alaska. along the coast southward to California.

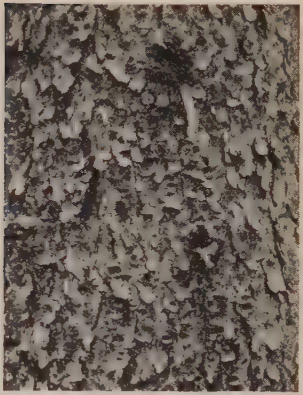
THE giant among the North American Spruces is a tree now known as Airplane Spruce. It acquired this name during the great World War, because it furnished large quantities of unsurpassed wood, used in the construction of airplanes. Before the war, this tree was known as Tideland Spruce, and locally as Sitka Spruce.

The moist climate of the north Pacific slope is its favorite home. There it reaches a diameter of six to ten feet, and a height of 150 to 200 feet is very common. Exceptional specimens reach a height of more than 250 feet, and exceed twelve feet in diameter. When grown in dense stands the trunks are tall and straight, have a moderate taper, and yield valuable saw timber free from knots.

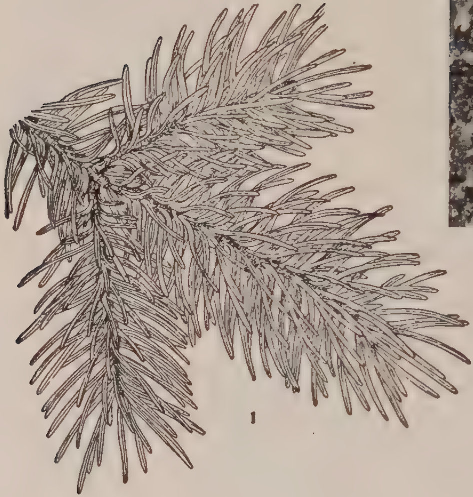
Only the choicest portion of selected trees is fit for use in the construction of airplanes. The length, elasticity, and toughness of the wood fiber are the qualities which recommend it for airplane construction, rather than the strength of the wood. It has other uses than airplane construction, for large quantities are used annually in the manufacture of paper pulp and sounding boards. Playground apparatus, household utensils, and poultry equipment are some additional common uses.

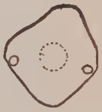
The Airplane or Tideland Spruce may be distinguished at any season of the year. Its large, clean trunks covered with thin, scaly, reddish-brown are distinctive. The first glance at a twig gives one the impression of a spruce. A close examination of the needles will show that they are straight and stiff, just as the other spruces, but differ from them in being flat instead of four-sided. The cones are reddish-brown in color and two to four inches long. All the eastern and most western spruces have smaller cones. The thin and jaggy cone-scales are also a very helpful means of identification.

Photo by U. S. Forest Service

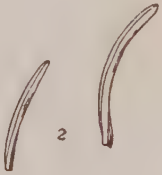


WHITE SPRUCE





1 = Winter branchlet; 2 = leaves; 3 = cross-section of leaf, enlarged; 4 = unopened cone; 5 = partly opened cone; 6 = cone-scale with seeds



Drawing from "Trees of Vermont"

WHITE SPRUCE

PICEA CANADENSIS (*Mill.*) *BSP.*

FAMILY.—Pine.

OTHER NAMES.—Labrador Spruce; Cat Spruce; Skunk Spruce.

GENERAL DESCRIPTION.—*Shape:* a medium-sized tree with straight, slowly tapering trunk, bearing a broad-based pyramidal crown. *Height:* 40 to 60, sometimes 80 feet, with a diameter of 2 feet. *Bark:* grayish to pale reddish-brown, slightly roughened with small scales. *Buds:* ovate, blunt-pointed, light-brown. *Leaves:* bluish-green, 4-angled, about ½ inch long, sharp-pointed; give forth a rank odor if bruised. *Flowers:* appear during April and May; pollen-bearing, oblong-cylindrical; ½ to ¾ of an inch long; fruit-producing, oblong-cylindrical, pale red or yellowish-green; about 1 inch long. *Fruit:* an oblong-cylindrical cone, 1½ to 2½ inches long, covered with thin, flexible, smooth-margined scales.

PREFERRED HABITAT.—Low, damp, but not wet, situations; also found on dry, sandy soils and high, rocky slopes and exposed hilltops.

RANGE.—A transcontinental tree extending from Quebec and Ontario to Manitoba, British Columbia and Alaska, and to within 20 miles of the Arctic Sea.

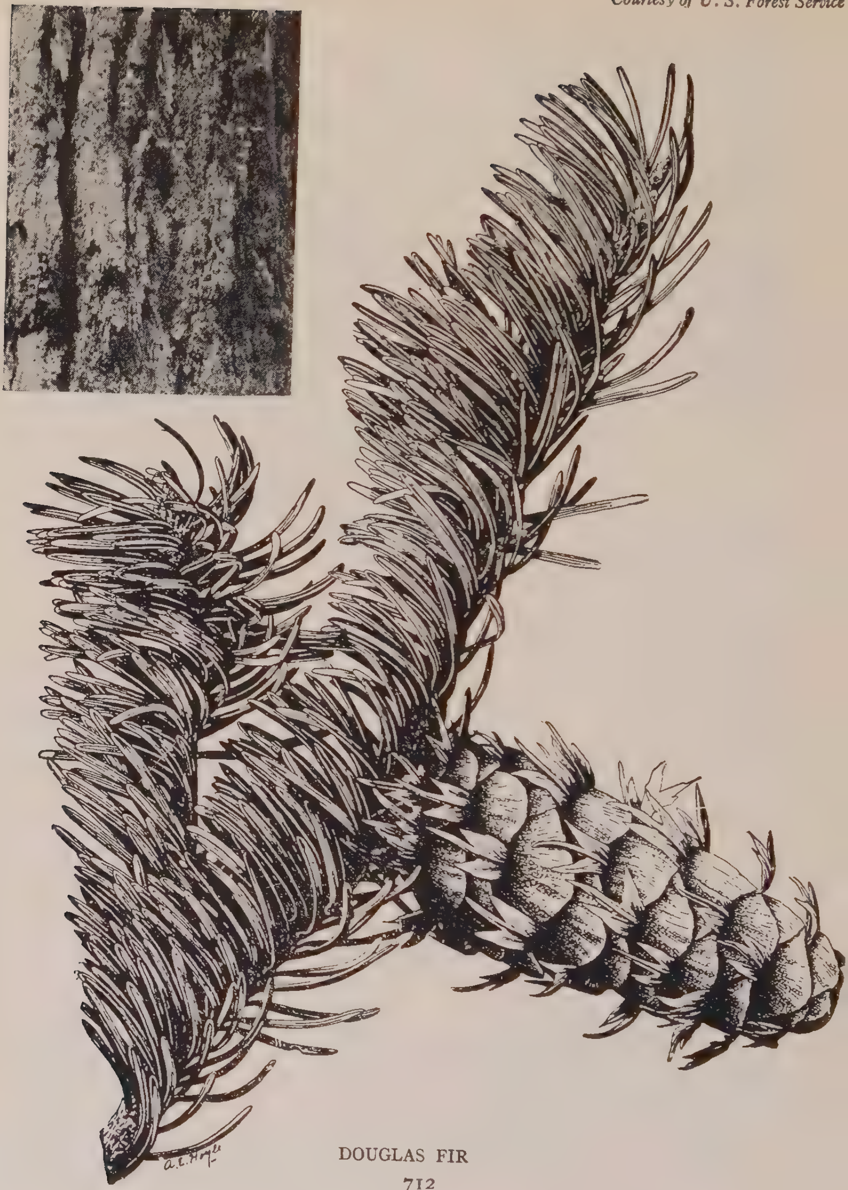
THE White Spruce is one of the most magnificent evergreen trees native to North America. When grown in the open it develops a beautiful symmetrical form and is densely clothed with branches from tip to base.

It is generally regarded as an Eastern forest tree, but it is actually a transcontinental tree, for it extends almost across the entire width of the country from the Atlantic to the Pacific, and reaches northward to within 20 miles of the Arctic Sea.

If one examines its branches closely, this tree may be separated readily from the Red Spruce and the Black Spruce, with which it is commonly associated, for its twigs are smooth, that is, hairs are entirely lacking upon them, while those of the Red Spruce and the Black Spruce are thickly covered with short hairs. It may also be distinguished by the fact that its leaves when bruised have an unpleasant odor, which has given it the name of Skunk Spruce and Cat Spruce. Its cones are also larger than those of the Black and Red Spruce.

The best foresters of Canada and the Northeast claim that White Spruce will in time become the principal forest tree grown upon vast areas used primarily for the production of pulpwood.

Courtesy of U. S. Forest Service



DOUGLAS FIR

DOUGLAS FIR

PSEUDOTSUGA TAXIFOLIA (*Poir.*) *Britton*

FAMILY.—Pine.

OTHER NAMES.—Douglas Spruce; Red Fir; Yellow Fir; Oregon Pine.

GENERAL DESCRIPTION.—*Shape:* broad, sharp-pointed, pyramidal. *Height:* 150 to 180, sometimes 200 feet, with a diameter from 3½ to 10 feet. *Bark:* dark brown on the outside, reddish-brown within, roughened by deep furrows, often very thick. *Buds:* conical, sharp-pointed, covered with numerous overlapping reddish-brown scales. *Leaves:* straight, flat, acute to obtuse at apex, yellowish-green, about 1 inch long and 1/12 of an inch wide. *Fruit:* a drooping cone 2 to 4 inches long. with numerous reddish-brown cone-scales and conspicuous reflexed bracts.

PREFERRED HABITAT.—Occurs on a wide range of sites from moist sea coast to dry mountain slopes.

RANGE.—Rocky Mountain region of the United States, northward to central British Columbia; on the coast region, from central California to southern Alaska.

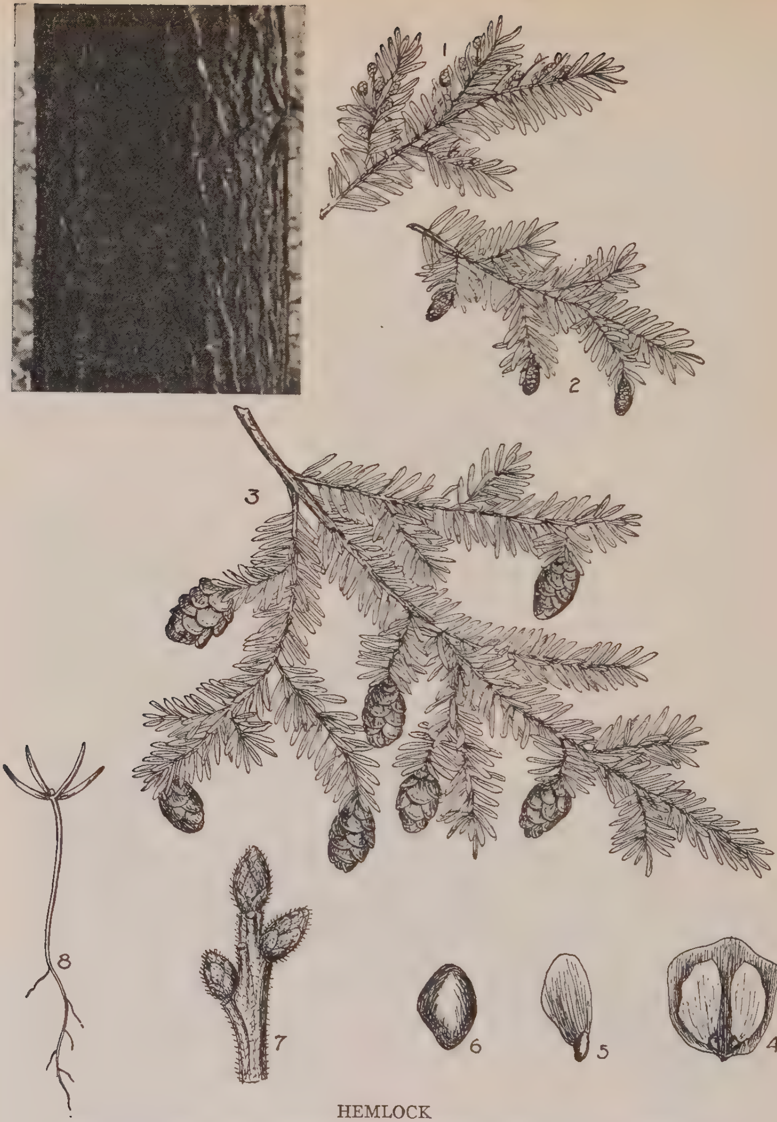
THE Douglas Fir is one of the giant trees of the West. Next to the Redwoods, it is the largest tree native to the United States. The tallest specimen on record attained a height of 380 feet. A few trees reached a diameter of fifteen feet, and one tree was felled which scaled 60,000 board feet of lumber.

The cones are the most distinctive feature of the tree. They are from two to four inches long and have a feathered appearance. This unusual appearance is due to the bracts which project about one-half inch beyond the cone scales. No other American cone-bearer possesses this characteristic so evidently.

In winter the buds enable the observer to identify the Douglas Fir. They are sharp-pointed, conical, and covered with numerous bright reddish-brown scales. The buds located at the ends of the twigs are approximately one-fourth of an inch long. The numerous buds found along the side of the twigs are somewhat shorter and blunter.

The bark is a helpful means of identification at all seasons of the year. It is dark-brown on the outside and reddish-brown within. Sometimes the bark becomes eighteen inches thick, and is roughened by deep furrows running up and down along the trunk.

The wood is heavy, hard, strong, coarse-grained, and rather difficult to work. No other single wood in the world equals the cut of Douglas Fir. It is used extensively in this country, and exported to every civilized country in the world.



HEMLOCK

1 = Branch with needles and staminate flowers; 2 = branch with needles and pistillate flowers; 3 = branch with needles and mature cones; 4 = a cone scale with two winged seeds, natural size; 5 = a winged seed, natural size; 6 = a seed, enlarged; 7 = leafless branch with buds, enlarged; 8 = a seedling, natural size

HEMLOCK

TSUGA CANADENSIS (*L.*) *Carriere*

FAMILY.—Pine.

OTHER NAMES.—Hemlock Spruce; Spruce Pine; Canadian Hemlock.

GENERAL DESCRIPTION.—*Shape:* conical and symmetrical. *Height:* 60 to 80, sometimes over 100 feet. *Bark:* grayish to reddish-brown, roughened by long shallow furrows; inner bark is cinnamon-red. *Leaves:* linear, flat, ½ of an inch long, rounded or notched at apex, borne on short stalks, dark green and glossy above, pale green on lower surface, and marked with two white lines. *Flowers:* appear during April or May; pollen-bearing, globular, yellow, about ¼ of an inch in diameter; seed-bearing, oblong and pale green. *Fruit:* a small short-stalked cone about ¾ of an inch long.

PREFERRED HABITAT.—Banks of streams, borders of lakes, ponds, and swamps.

RANGE.—Nova Scotia to Minnesota, south to Pennsylvania, and along the mountains to Alabama.

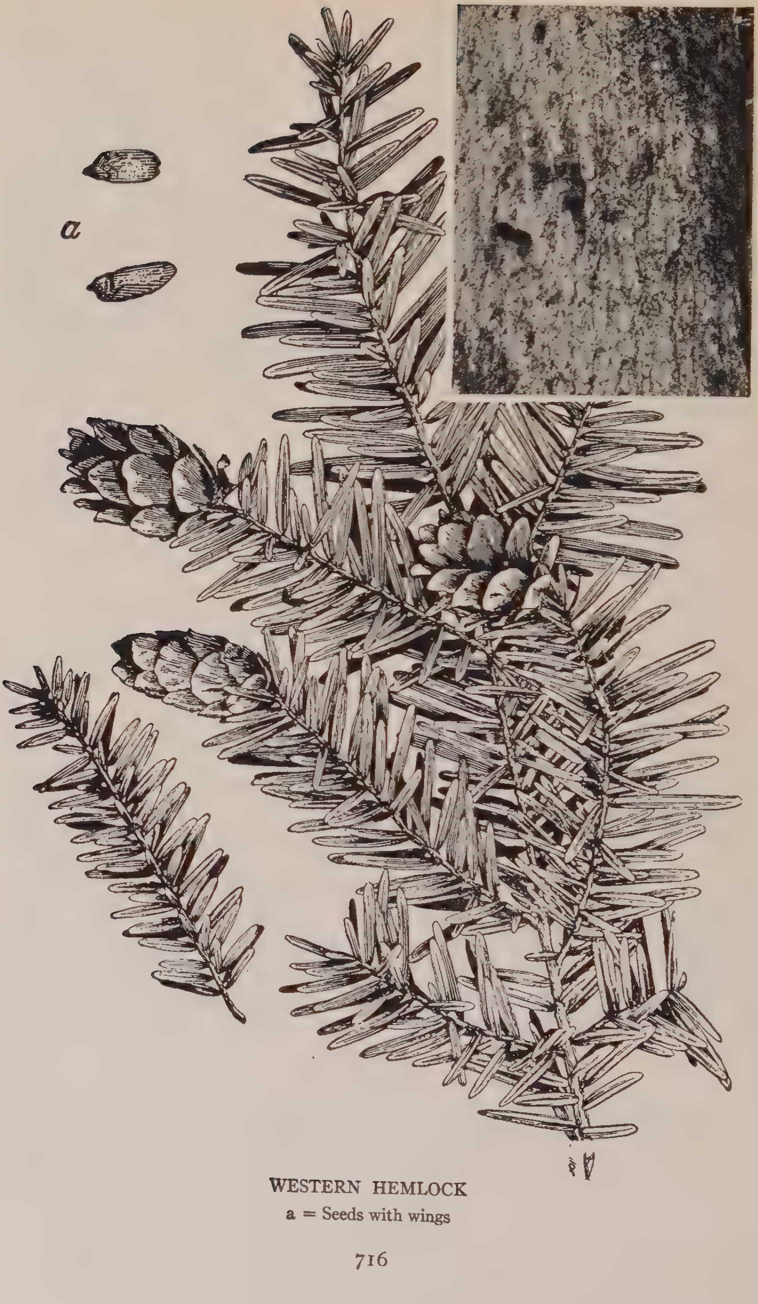
HEMLOCK trees may be recognized by their small flat leaves with two white stripes on the lower surface. The needle-like leaves are jointed to short woody stalks, and are arranged in two flat rows alongside the twigs. There is a third and rather inconspicuous row of small leaves on the top of the twigs extending in the same direction as the twigs.

The cones are short-stalked, about three-quarters of an inch long, grow on the tip of the twigs, and often persist throughout the winter. The wood is hard, weak, brittle, liable to splinter, and difficult to work. It is used chiefly for rough construction work, coarse lumber, paper pulp, boxes, crates, and laths.

The Hemlock may be distinguished at all seasons of the year by its distinctive bark, which is usually reddish-brown, and scaly to furrowed on the outside, and rich cinnamon-red within. If one takes a pocket-knife and bores through the bark, and finds a rich cinnamon-red inner bark, he is in possession of a positive distinguishing characteristic of the Hemlock.

As an ornamental tree the common eastern Hemlock has no equal among the American evergreen trees. In form it somewhat resembles the Spruces, but its slender, pliant, and irregularly distributed twigs covered with small flattened leaves give it an unusually pleasing and graceful appearance, which is equaled by only a few, and surpassed by no other cone-bearing tree.

Courtesy of U. S. Forest Service



WESTERN HEMLOCK

a = Seeds with wings

Western Hemlock

Tsuga heterophylla (*Raf.*) *Sargent*

Family.—Pine.

Other Names.—Hemlock Spruce; Hemlock; Alaska Pine.

General Description.—*Shape:* crown small, narrowly pyramidal, composed of slender branches which droop in open-grown specimens. *Height:* 125 to 160 feet with a diameter of 2 to 5 feet. *Bark:* on young trees thin, finely scaly, russet-brown; on old trunks 1 to 1½ inch thick, hard, deeply furrowed, dark russet-brown. *Leaves:* deep glossy green, flat, grooved above, rounded at end, ¼ to 7/8 of an inch long, with a thread-like stem. *Fruit:* a small, few-scaled cone ¾ to 1¼ inch long, matures latter part of August and falls during winter.

Preferred Habitat.—Moist situations from sea level to 7,000 feet elevation.

Range.—Pacific Coast region, from Alaska to northern California, inland to southern British Columbia, northern Idaho and the Cascades of Oregon and Washington.

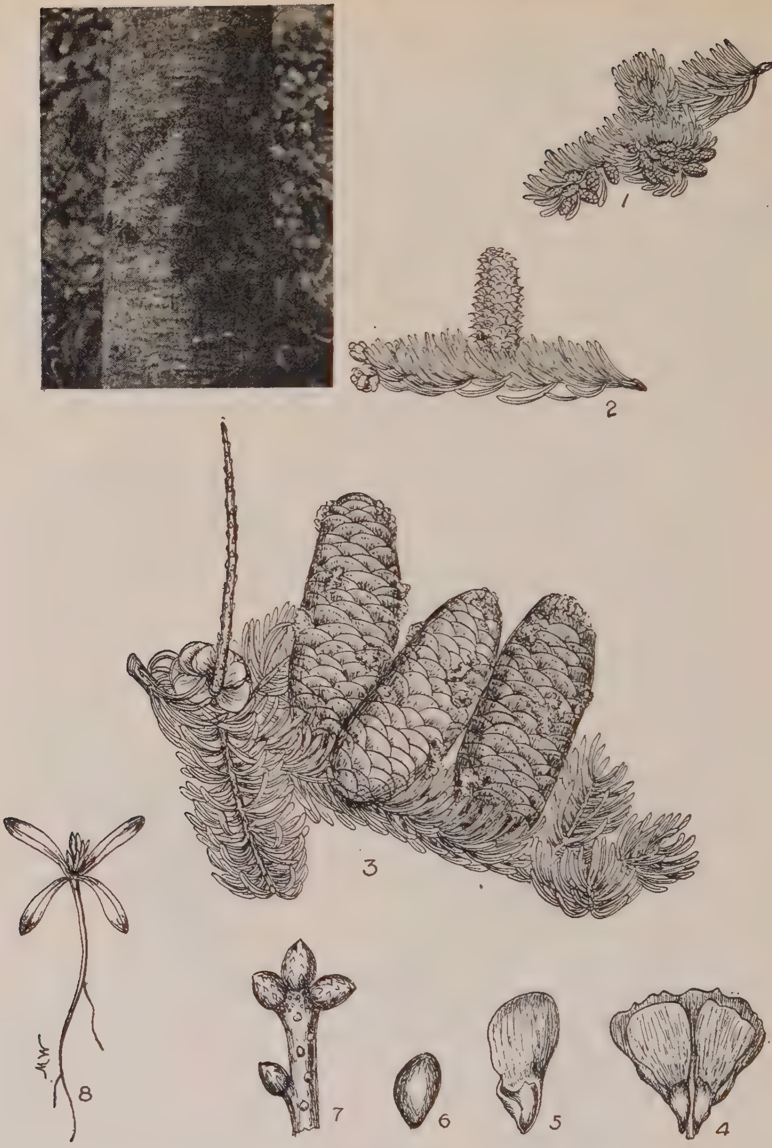
The Western Hemlock is a large forest tree. It frequently reaches a height of 125 feet and a diameter of 4 feet. Many of the large trees are from 300 to 500 years old.

Its tall, clean, smooth-looking trunks, fine foliage, and drooping branchlets make it easy to distinguish this tree from its associates. It is much larger than the Eastern Hemlock, and also produces somewhat larger cones, which are short-stalked.

The leaves are flat, rounded at the end, about ¼ to 7/8 of an inch long and borne on a thread-like stalk. They clothe the twigs thickly, but on account of their small size give a thin appearance to the crown of the tree.

The wood of the Western Hemlock is light, soft, fine-grained, and works like soft pine, and the bark yields a larger percentage of tannin than the Eastern Hemlock so extensively used for tanning.

It seems reasonable to predict that Western Hemlock will play an important rôle in the future of forestry in the West.



BALSAM FIR

1 = Branch with needles and staminate flowers; 2 = branch with needles and pistillate flowers; 3 = branch with needles, three cones and one cone axis from which the scales have fallen; 4 = a cone scale with two winged seeds, natural size; 5 = a winged seed, slightly enlarged; 6 = a seed, enlarged; 7 = leafless branch with buds, slightly enlarged; 8 = a seedling

BALSAM FIR

ABIES BALSAMEA (*L.*) *Miller*

FAMILY.—Pine.

OTHER NAMES.—Fir; Balsam; Blister Pine.

GENERAL DESCRIPTION.—*Shape:* conical and symmetrical. *Height:* 30 to 50, sometimes 100 feet. *Bark:* on old trunks reddish-brown, somewhat scaly; on young trunks smooth, thin, grayish-brown, and marked with projecting resin blisters. *Buds:* clustered at end of twigs, egg-shaped to round, covered with very glossy, varnished orange-green scales. *Leaves:* flat, blunt-pointed, stalkless, about 1 inch long, dark green on upper surface, pale green with two white lines on lower surface, apparently arranged in two flat lateral rows. *Flowers:* appear during May or June; pollen-bearing, yellow, about ¼ of an inch long; seed-bearing, purple, about 1 inch long. *Fruit:* an erect cylindrical, dark purple to brown cone, from 2 to 4 inches long; cones mature in one season, and scales fall off, leaving a bare central axis.

PREFERRED HABITAT.—Swamps and other wet places.

RANGE.—Labrador south through the mountains of Pennsylvania to Virginia, west to Alberta and Minnesota.

THE Balsam Fir, which is one of the most beautiful evergreen trees native to North America, is essentially a tree of the Northwoods, where it frequents bogs, swamps, and other wet places.

A mere glance at a Balsam Fir tree is usually sufficient to distinguish it from any other eastern tree. The leaves are flat, stalkless, deep green on the upper surface, and pale green with two white lines on the lower side. It is a common practice in the Northwoods to collect large quantities of leaves and use them in filling pillows and cushions, for the leaves, when dried, emit a very fragrant, balsamic odor. The grayish-brown, smooth bark, marked with projecting blister-like swellings, is a positive means of identifying this tree. Upon puncturing one of these blisters, a clear balsam flows forth. The buds are egg-shaped to round in outline, about one-sixth of an inch long, clustered at the end of the twigs, and covered with glossy orange-green scales. The cones are from two to four inches long, cylindrical in form, and stand erect on the twigs. Their cone scales fall off soon after they mature and leave a bare central axis.

Most people who have lived or visited in the regions where the Balsam Fir grows have a distinct and lasting impression of its appearance. It is the king among our Christmas trees, for it has an attractive form, dense crown, and beautiful foliage.

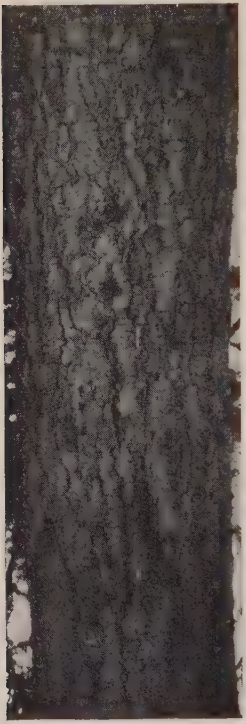
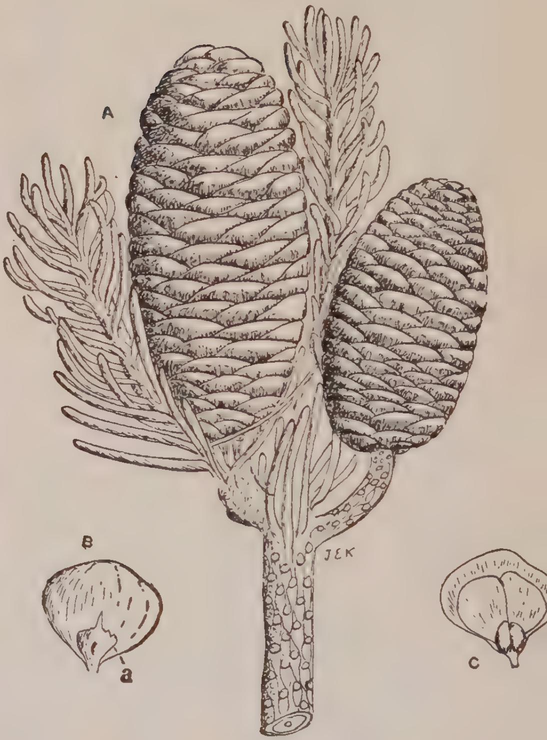


Photo by U. S. Forest Service



Courtesy of the U. S. Dept. of the Interior

ALPINE FIR

A = Twig and cone in natural position; B = bract, at a, and lower side of seed-bearing scale; c = upper side of seed-bearing scale with seeds in position

ALPINE FIR

ABIES LASIOCARPA (*Hook.*) *Nuttall*

FAMILY.—Pine.

OTHER NAMES.—Balsam; White Fir; White Balsam.

GENERAL DESCRIPTION.—*Shape:* crown long, narrowly conical; trunk short. *Height:* may reach 60 to 90 feet; often less than 10 feet, but occasional specimens reach 130 feet. *Bark:* thin, hard, flinty, ashy-gray, often chalky-white, usually smooth. *Leaves:* deep blue-green with a silvery tinge, flat, pointless, 1 to 1¾ inch long, evidently massed and pointing upward on top sides of branches. *Fruit:* a deep purple cone from 2 to 4 inches long and 1 to 1½ inch in diameter.

PREFERRED HABITAT.—Cool and moist sub-alpine situations; on slopes up to timber line and about mountain lakes and meadows.

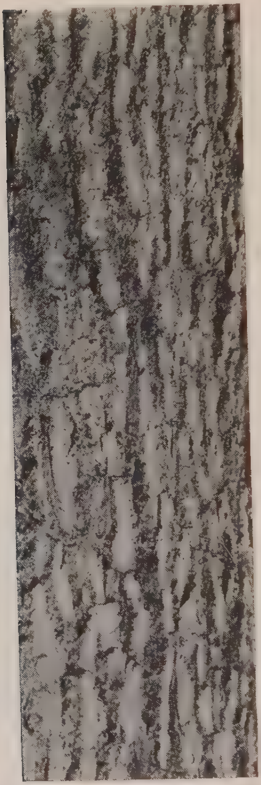
RANGE.—Southeastern Alaska, British Columbia, through Washington, Idaho, and Montana to southern Arizona and New Mexico.

THE Alpine Fir is one of the smallest, and probably the least known of the firs of the Pacific Coast. It grows in very inaccessible places and rarely exceeds 100 feet in height and 2 feet in diameter. Rare old trees, however, have been found which reach a height of 160 feet and a diameter of 4 feet. In exposed situations it is not unusual to find old specimens that are only 3 or 4 feet high but have lateral branches lying upon the ground many times longer than the height of the trees.

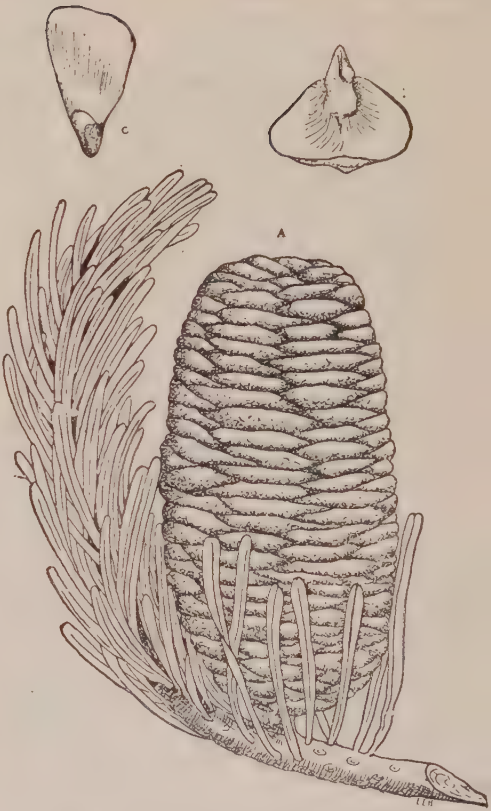
The Alpine Fir stands out among all its associates by reason of its long conical crown tipped with a spire-like point, which can be recognized at a long distance. Other distinctive features of this tree are its hard, flinty, ashy-gray bark, which is rarely fissured but usually marked with chalky-white blotches, and its dense tough branches, which droop at the base of the crown.

The pale bluish-green needles and the purplish cones from 2 to 4 inches long are also helpful means of distinguishing this unique tree of our western mountains, where it ascends almost to the timber line.

Photo by U. S. Forest Service



Courtesy of U. S. Dept. of Interior



GRAND FIR

A = Twig and cone in natural position; B = bract and lower side of seed-bearing scale; C = seed

GRAND FIR

ABIES GRANDIS *Lindley*

FAMILY.—Pine.

OTHER NAMES.—White Fir; Yellow Fir; Silver Fir; Great Silver Fir.

GENERAL DESCRIPTION.—*Shape:* crown narrow and pointed in young trees, somewhat rounded in old specimens. *Height:* 150 to 200, sometimes 250 to 275 feet, with diameter of 3 to 4 feet. *Bark:* on young trunks smooth and ashy-brown, dotted with chalky patches; on old trunks shallowly furrowed and dotted with gray-white blotches. *Leaves:* deep yellowish-green, white on lower surface, shiny, flat, grooved, blunt, notched at end, 1 to 2¼ inch long, appear in two lateral rows. *Fruit:* a light yellowish-green, cylindrical cone, 2½ to 4½ inches long and 1 to 1½ inch thick.

PREFERRED HABITAT.—Moist situations. Common on alluvial stream bottoms, lower mountain slopes, depressions, and gulches.

RANGE.—Southern British Columbia to northern Idaho, western Montana, and northern coast of California.

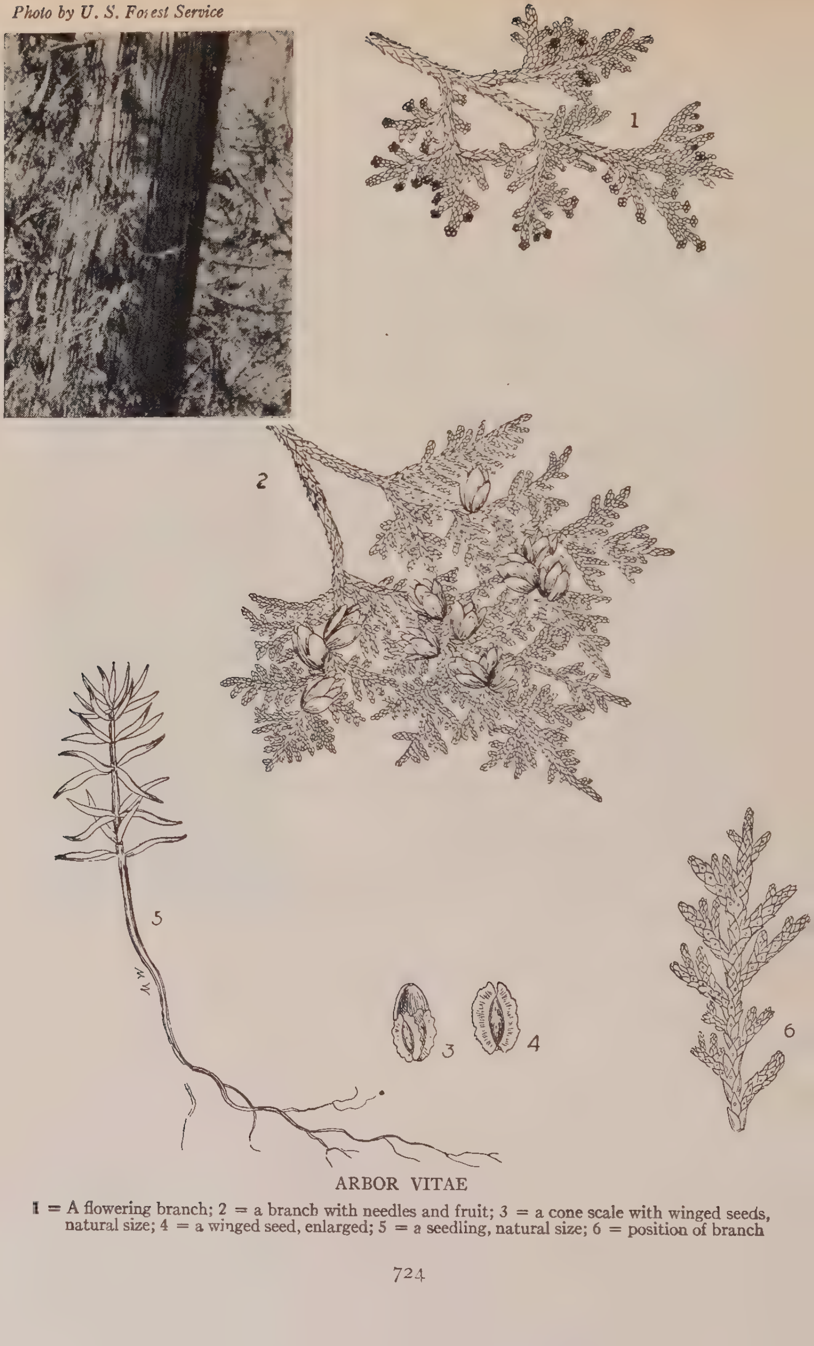
THE name "Grand Fir" is very appropriate for this tree; for it is a very stately and grand tree when fully matured. It grows to a height of 150 to 200 feet upon favorable situations, such as bottom-lands, but exceptional specimens reach a height of 250 to 275 feet. Its stems are remarkably straight, have little taper, and bear narrow, open, conical crowns.

This tree is generally called "White Fir" for the reason that its smooth or shallowly furrowed bark is dotted with grayish-white blotches. The bark is very hard and horny and rarely over 1½ inch thick. The leaves are deep yellowish-green, flat, 1 to 2¼ inches long; notched at the end, and appear to grow in two rows on opposite sides of the branches.

Other helpful distinguishing characteristics are the pale russet-brown and minutely hairy twigs of the season, the resinous buds, and the light yellowish-green, cylindrical cones from 2½ to 4 inches long.

The real merits of this stately forest tree of the Pacific Coast region are just beginning to be known. It will not be long until it will take a front-line place in the practice of American forestry.

Photo by U. S. Forest Service



ARBOR VITAE

1 = A flowering branch; 2 = a branch with needles and fruit; 3 = a cone scale with winged seeds, natural size; 4 = a winged seed, enlarged; 5 = a seedling, natural size; 6 = position of branch

ARBOR VITÆ

THUJA OCCIDENTALIS *Linnæus*

FAMILY NAME.—Pine.

OTHER NAMES.—Cedar; White Cedar.

GENERAL DESCRIPTION.—*Shape:* conical and symmetrical. *Height:* 25 to 50, sometimes 75 feet. *Bark:* grayish-brown to reddish, furrowed, peels off in thin fibrous strips. *Buds:* very small, not scaly, hidden completely by scale-like leaves. *Leaves:* scale-like, 1/8 of an inch long, overlap each other closely, aromatic when crushed, marked with conspicuous glandular dots; those on the side of twigs are keeled, while those on the face of the twigs lie flat. *Flowers:* appear during April or May; pollen-bearing, inconspicuous, yellow, and almost round; seed-bearing, small, purplish, and ovoid. *Fruit:* an oblong cone, with 6 to 12 blunt-pointed, reddish-brown scales, about ½ inch long.

PREFERRED HABITAT.—Low, swampy situations and cold bogs, but will grow in drier places.

RANGE.—Southern Labrador west to Manitoba and Minnesota, and south to North Carolina and Tennessee locally.

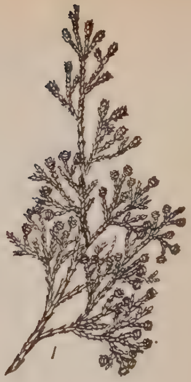
THE common Arbor Vitæ is one of the most formal forest trees of eastern North America. It frequents cold bogs and swamps and occurs locally on moist hillsides.

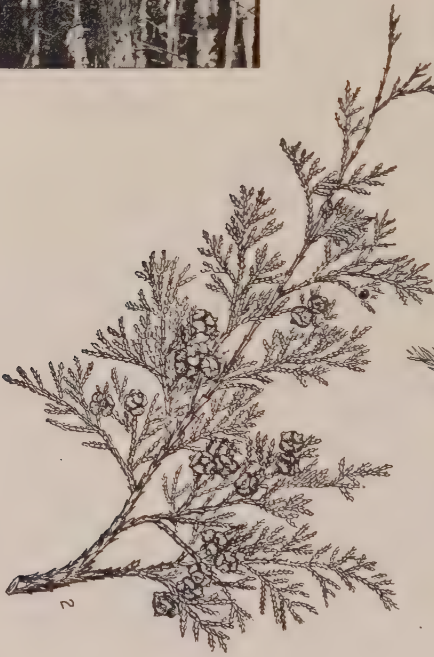
The leaves of the Arbor Vitæ are only about one-eighth of an inch long and scale-like. They are arranged in pairs. Each succeeding pair alternates with the pair next to it. The leaves on the side of the twigs are keeled, while those on the face of the twig are flat; hence the flat appearance of the twigs when viewed from above. Each leaf is marked with a glandular dot, which is probably the source of the aromatic odor given off when a twig is crushed. The leaves persist for a number of years, during which time they cover the twigs so completely that the latter cannot be seen.

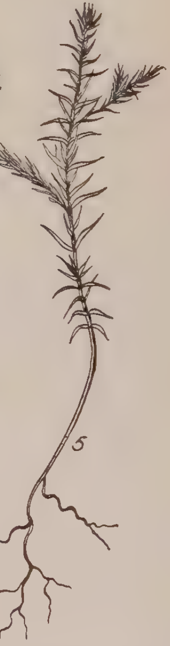
The oblong cones are a very helpful means of identification. They occur in loose clusters along the twigs, and consist of six to twelve blunt-pointed reddish-brown scales, about one-half of an inch long.

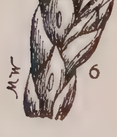
The trunk usually divides near the base into two or three branches, which grow up almost vertically alongside each other. The basal part of the trunk is usually furrowed, and the covering bark is grayish to reddish-brown, and peels off into thin fibrous strips.

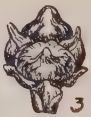
Photo by U. S. Forest Service











WHITE CEDAR

1 = A flowering branch; 2 = a branch with needles and fruit; 3 = a cone, slightly enlarged; 4 = a winged seed, slightly enlarged; 5 = a seedling, natural size; 6 = portion of branch, enlarged

WHITE CEDAR

CHAMAECYPARIS THYOIDES (*L.*) *BSP.*

FAMILY.—Pine.

OTHER NAMES.—Cedar; Coast White Cedar; Southern White Cedar.

GENERAL DESCRIPTION.—*Shape:* conical, pointed, symmetrical. *Height:* 30 to 50, sometimes 90 feet. *Bark:* reddish-brown, slightly furrowed, peels off in thin film-like scales. *Leaves:* small, scale-like, sharp-pointed, bluish-green, closely overlapping, arranged in opposite pairs which give a four-ranked appearance. *Flowers:* appear during March or April; pollen-bearing, oblong, ¼ of an inch long; seed-bearing, round, about 1/10 of an inch in diameter. *Fruit:* a small, round, brownish-purple cone, about ¼ inch in diameter and bearing shield-shaped scales.

PREFERRED HABITAT.—Swamps and marshes.

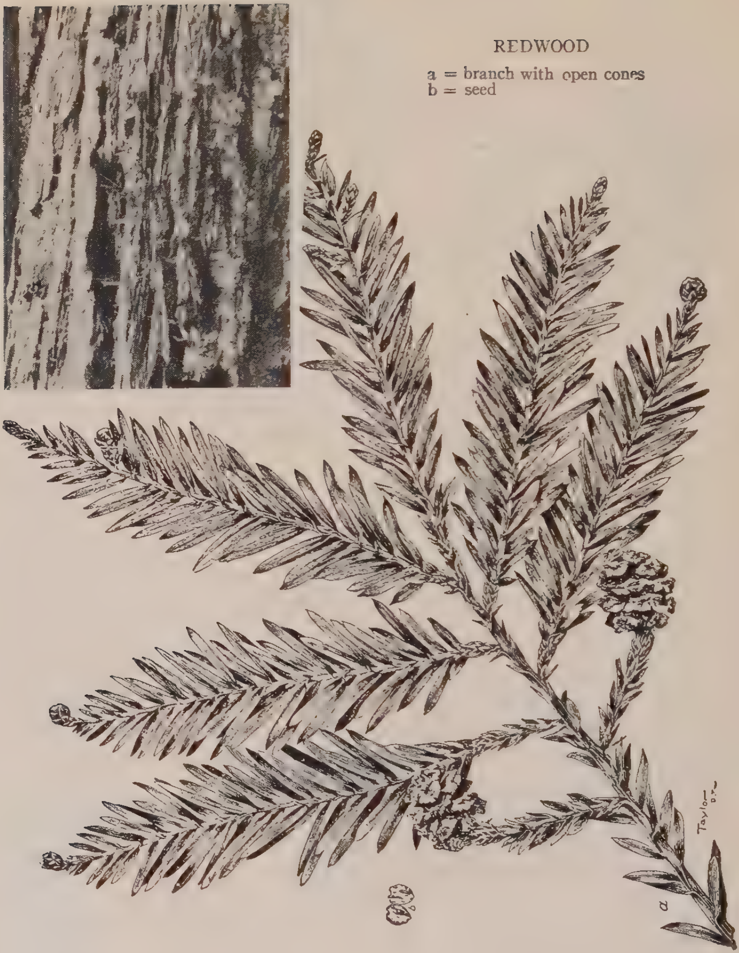
RANGE.—Cape Breton Island south along coast to Florida and Mississippi.

THE White Cedar is essentially a species of the coastal plain region of the eastern United States, where it usually is found in swamps and marshes. It seems to thrive best when its roots are surrounded with water most of the year.

The White Cedar is easily distinguished from all our eastern conifers, particularly the closely related Arbor Vitæ, by its round and brownish purple cones, which are about one-quarter of an inch in diameter and bear several shield-shaped scales. The outer face of each scale is marked by a slight projection, and under each scale occur one or two seeds with small wings.

The twigs of the White Cedar are not so stout, flat, or distinctly fan-shaped as those of the Arbor Vitæ. The leaves are yellowish-green in color, while those of the former are bluish-green, and sometimes sharp-pointed or awl-shaped. A small glandular dot is often found on the backs of the leaves. It is, however, less conspicuous than those found on the leaves of the Arbor Vitæ.

The White Cedar is not so attractive for ornamental planting as the Arbor Vitæ, for it loses its lower branches, and the general appearance of the tree is scraggy when it becomes older.



REDWOOD

a = branch with open cones
b = seed

Courtesy of U. S. Forest Service

Redwood

Sequoia sempervirens *Endlicher*

Family.—Pine.

General Description.—*Shape:* when young, pyramidal; when old, small, shallow, and irregularly crowned. *Height:* 150 to 200, sometimes 350 feet, with an occasional diameter of 25 feet. *Bark:* thick, broad-ridged, separates into long, fibrous, dark-brown strips. *Leaves:* dark green above, pale green below, narrow, ½ to 1 inch long, sharp-pointed, two-ranked, spreading at wide angles to the twigs. *Flowers:* pollen-bearing, short-stalked, egg-shaped, blunt-pointed; seed-bearing, oblong, 1/5 of an inch long. *Fruit:* a small, oblong, hard, thick-scaled reddish-brown cone.

Preferred Habitat.—Moist soil and fog-laden climate.

Range.—Coast region of California and southwestern Oregon.

Every feature of the Redwood is interesting. Its only close relative is the Big Tree. The Redwood and the Big Tree comprise the group of trees known by the scientific name *Sequoia*. The name Sequoia was given to them in commemoration of Sequoyah, a talented Cherokee, also called George Guess, who prepared the first Indian alphabet. These two American forest trees are among the chief natural wonders of the world. The greatest (reliable) height is probably 365 feet, and most of the trees remain under 300 feet. An occasional specimen reaches a diameter of more than fifteen feet, but most of them are less than ten or twelve feet. The maximum age of the oldest specimen known to date does not exceed 4,000 years, and most of them remain under 2,000 years.

The Redwood is usually regarded as typical of the group; but since the Big Tree is the only other living representative, we may become acquainted with both of them by comparing their chief distinguishing characteristics:

Redwood *Sequoia sempervirens*	Big Tree *Sequoia gigantea*
Found only near the Pacific coast.	Found chiefly in the Sierras.
Reaches the greater height.	Reaches the greater diameter.
Leaves, usually spreading and of two forms, lance-like and scale-like.	Leaves all scale-like.
Cones usually less than one inch long.	Cones usually over two inches long.
Buds covered with scales.	Buds not covered with scales.
Bark cinnamon-brown.	Bark reddish-brown.

BALD CYPRESS

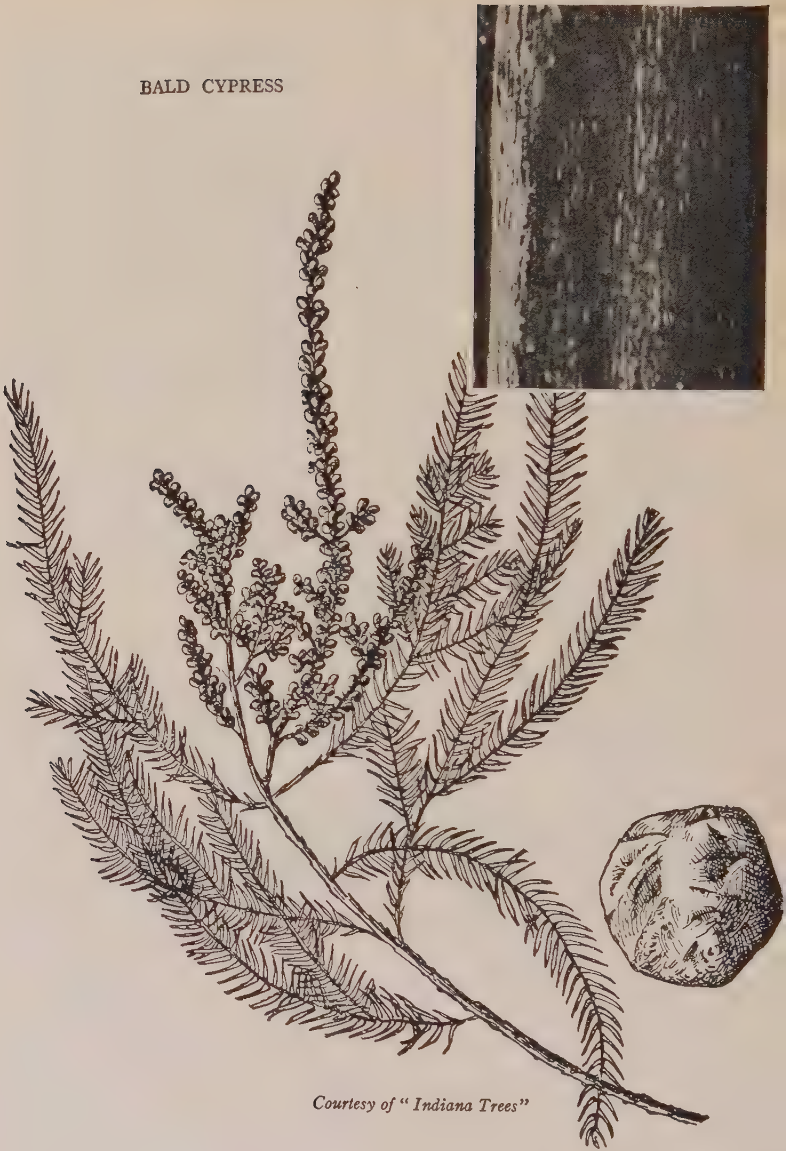


Photo by U. S. Forest Service

Courtesy of " Indiana Trees"

BALD CYPRESS

TAXODIUM DISTICHUM (*L.*) *Richard*

FAMILY.—Pine.

OTHER NAMES.—Cypress; Deciduous Cypress.

GENERAL DESCRIPTION.—*Shape:* pyramidal to broad and round-topped. *Height:* 75 to 100, sometimes 150 feet. *Bark:* cinnamon-red, shallowly furrowed, covered with fibrous scales. *Leaves:* about ½ of an inch long, narrow, dark green above, yellowish-green to silvery-white below. *Flowers:* pollen-bearing, purplish in color, arranged in clusters 4 to 5 inches long and 1 to 2 inches wide; seed-bearing, scattered near end of branches. *Fruit:* an almost round brown cone, about one inch in diameter.

PREFERRED HABITAT.—Moist, wet and swampy situations.

RANGE.—Coastal plain region from southern Delaware and southern New Jersey to Florida and Louisiana, and northward through the Mississippi Valley to Southern Indiana.

THE Bald Cypress is no doubt familiar to everyone who has lived in or journeyed through the Coastal Plains region of the South.

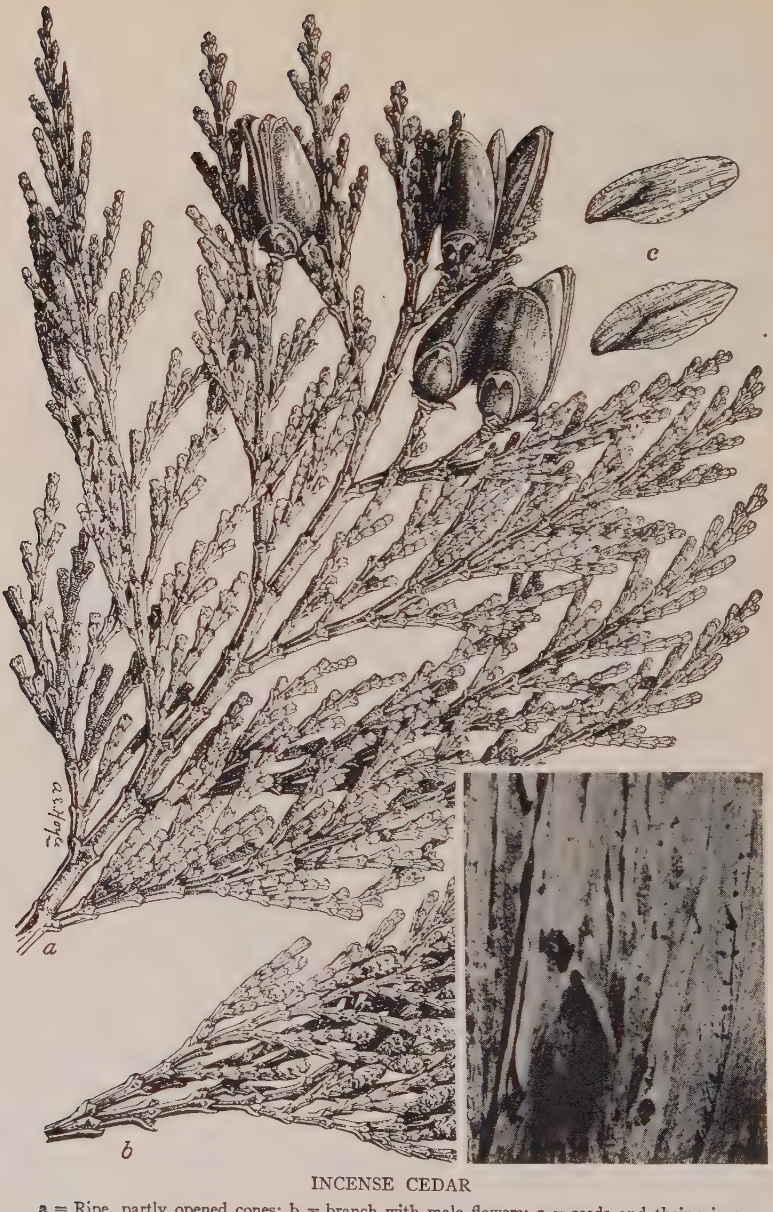
This tree has a number of interesting habits. It sheds all its leaves each fall, this being a rare habit among cone-bearing trees. The leaves do not fall singly, but those found on a slender twig drop together, taking with them the branchlet to which they are attached.

It frequents swamps, there growing upon soil submerged during the entire year. The most curious habit of this tree is the formation of cypress "knees," which are cone-like brown projections of the roots extending for several feet above the surface of the water. The exact function of these "knees" is not known, but it is generally thought that they are developed for the purpose of getting air to the submerged roots.

The brown cones which are round, rough, and about the size of the nut of the Black Walnut, are also a helpful means of identifying this interesting tree.

The Bald Cypress tree lives to a great age. Many trees have been felled which had attained an age of 400 to 600 years, and it is not difficult to find trees now that range in age from 750 to 1,000 years.

Courtesy of U. S. Forest Service



INCENSE CEDAR

a = Ripe, partly opened cones; b = branch with male flowers; c = seeds and their wings

INCENSE CEDAR

HEYDERIA DECURRENS (*Torrey*) *K. Koch*

FAMILY.—Pine.

OTHER NAMES.—Bastard Cedar; Red Cedar; Post Cedar.

GENERAL DESCRIPTION.—*Shape:* conical and compact in early life, on old trees more or less irregularly outlined. *Height:* 90 to 100, sometimes 150 feet, and a diameter of about 7 feet. *Bark:* bright yellowish-brown, irregularly furrowed, scaly to shreddy. *Leaves:* occur in whorls of four, scale-like, extend down along twigs; lateral leaves keeled and bear glands. *Flowers:* appear very early, sometimes during late January; pollen-bearing, golden yellow and produced in great numbers at tips of twigs; seed-bearing, roundish to oblong, about 1/8 of an inch long. *Fruit:* a drooping, oblong, reddish-brown cone, about 1 inch long, composed of 3 pairs of opposite scales.

PREFERRED HABITAT.—Occurs on a great variety of soils, and a wide range of climate.

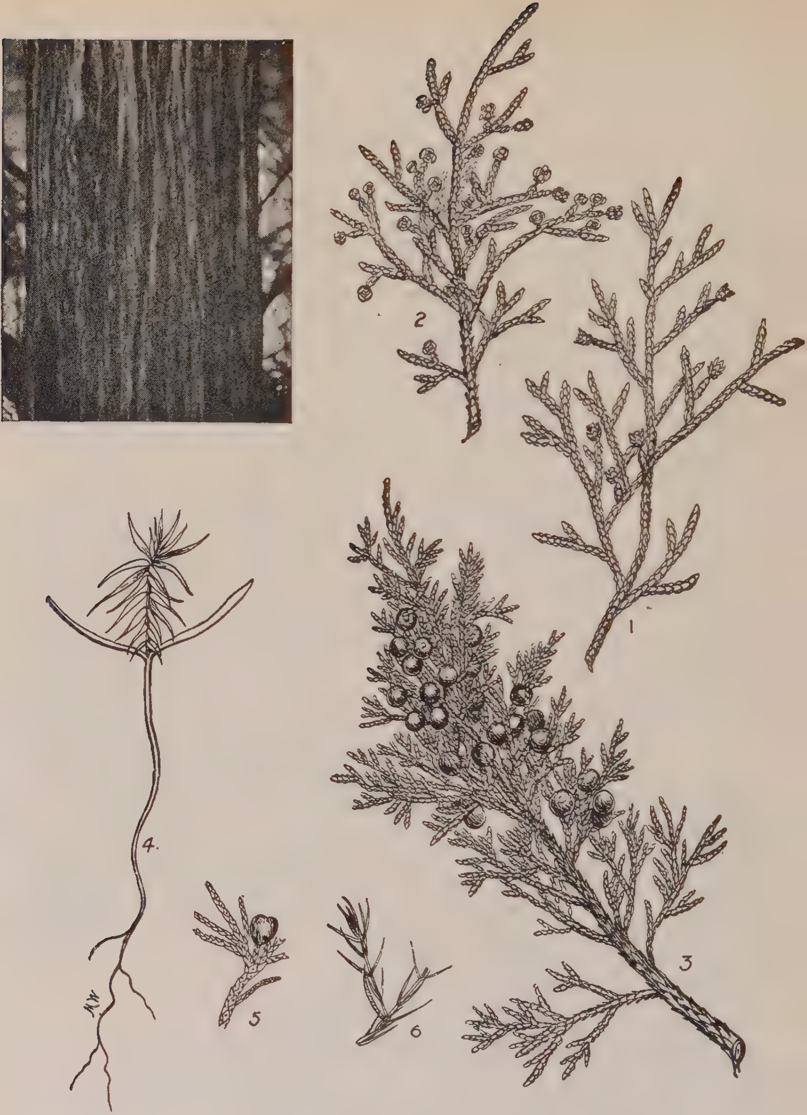
RANGE.—Oregon southward through California to Lower California, and east to Nevada.

THE Incense Cedar attains a great age and a large size. Trees ranging from 350 to 500 years are not unusual, and occasionally they may become 800 to 1,000 years old. It varies greatly in size, but mature specimens average about 100 feet in height and three to four feet in diameter.

This tree has some striking distinguishing characteristics. Its drooping, blunt-pointed cones are entirely unlike those of any other American cone-bearing tree. They are from three-quarters to one and one-half inch long, and consist of three pairs of opposite scales, the middle pair alone bearing seeds. The shreddy, deeply-furrowed, yellowish-brown or cinnamon-colored bark is also a very helpful means of identification.

The most distinctive and attractive feature of the tree is the open, fan-shaped spray of branches. Except for the arrangement of the sprays, the branchlets covered with scale-like leaves resemble those of the eastern Arbor Vitæ.

The merits of the Incense Cedar are becoming better known each year. It has been successfully planted for ornamental purposes in part of continental Europe. A more extensive planting of it throughout the warmer part of the East is recommendable.



RED CEDAR

1 = A branch with pistillate flowers; 2 = a branch with staminate flowers; 3 = a branch with needles and fruit; 4 = a seedling, natural size; 5 = a branch with scale-like needles and a single berry-like fruit, natural size; 6 = a branch with awl-shaped needles

RED CEDAR

JUNIPERUS VIRGINIANA *Linnæus*

FAMILY.—Pine.

OTHER NAMES.—Cedar; Juniper; Red Juniper; Savin.

GENERAL DESCRIPTION.—*Shape:* conical to pyramidal, and symmetrical. *Height:* 40 to 50, sometimes 100 feet. *Bark:* frequently furrowed, reddish-brown, peels off into long, narrow, stringy strips. *Leaves:* scale-shaped and awl-shaped may be found; scale-shaped are commonest, about 1/16 of an inch long, closely appressed to twigs, dark bluish green, and four-ranked; awl-shaped occur on young trees and vigorous shoots, are narrow, sharp-pointed, spreading, do not overlap, and are arranged in twos and threes. *Flowers:* appear during April or May; pollen-bearing and seed-bearing usually occur on different trees; pollen-bearing are short-stalked, yellow, comprise about 10 stamens, occur in large numbers; seed-bearing are small, comprise about 6 spreading, sharp-pointed bluish scales. *Fruit:* a dark blue berry, about ¼ of an inch in diameter, often covered with a whitish bloom.

PREFERRED HABITAT.—Almost any location from a swamp to a sterile, rocky cliff. Reaches its best development on alluvial soils of the Southern States.

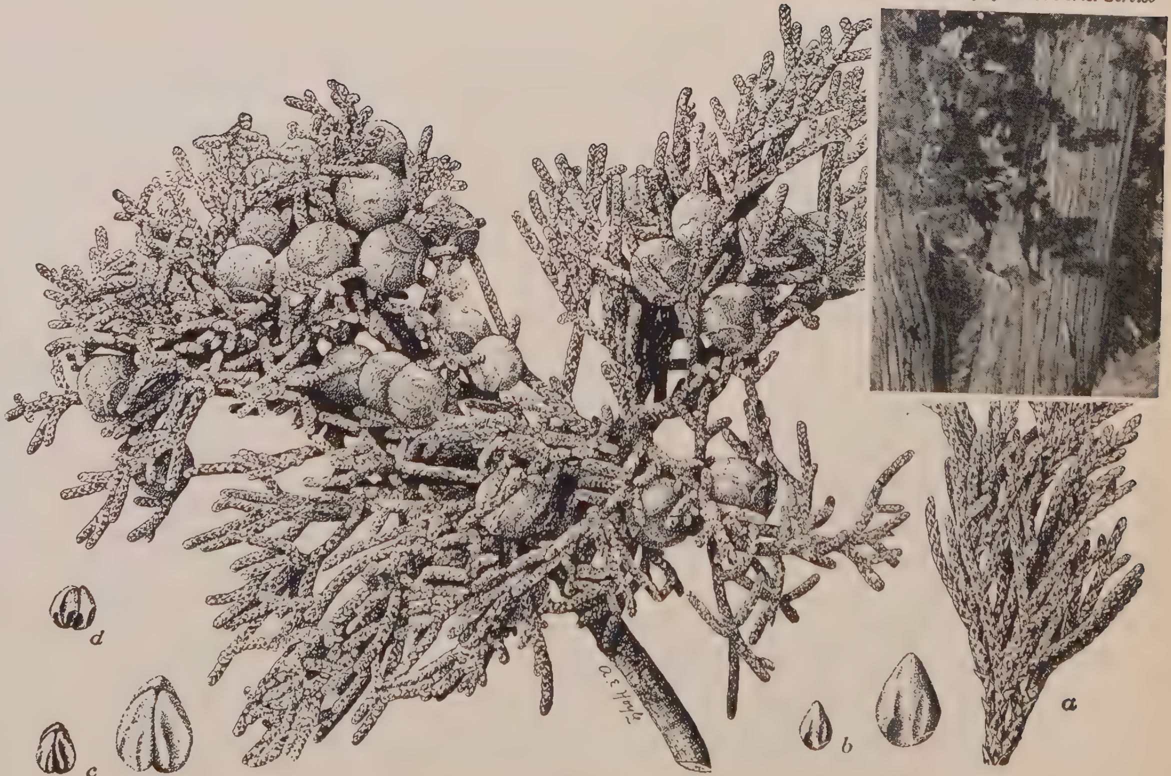
RANGE.—Nova Scotia west to Ontario and South Dakota, south to Florida and Texas.

THE Junipers are the most widely distributed group of trees on our continent. They may be found in nearly every State in the Union. Next to the Pines they have the largest number of representatives in North America of all the groups of trees belonging to the Pine Family.

Our common Red Cedar is the only native species of any commercial importance belonging to this group. Its berry-like fruit is known to every inhabitant of the country districts in which the trees occur. The berries are about the size of a small pea, dark blue in color and often covered with a white bloom. These berries are freely eaten by birds.

The leaves are also a helpful means of identification. Two kinds are recognized, namely, the scale-shaped, which are the commonest, and the awl-shaped, which occur on young trees and vigorous shoots.

The wood is soft, fragrant, works easily, has distinct red heartwood, and is very durable in contact with the soil. It is also notable for its fragrance, which property is supposed to ward off moths and other destructive insects, and consequently it is much used in the construction of clothes chests and closets. It was formerly widely used in the manufacture of lead pencils.



Courtesy of U. S. Forest Service

WESTERN JUNIPER

a = New shoot showing large form of leaves; b, c, d = showing variable number of seeds (natural size and

WESTERN JUNIPER

JUNIPERUS OCCIDENTALIS *Hooker*

FAMILY.—Pine.

OTHER NAMES.—Juniper; Cedar; Western Red Cedar; Mountain Juniper.

GENERAL DESCRIPTION.—*Shape:* crown round-topped, open, extending to a few feet from ground; trunk short and thick. *Height:* 15 to 20 feet, rarely 60 feet, and 40 inches in diameter. *Bark:* clear, light cinnamon-brown, firm, stringy, ½ to 1 inch thick, cut by wide shallow furrows. *Leaves:* short, pale ashy-green, scale-like, hug stiff twigs tightly and marked with a prominent white resin pit. *Fruit:* a bluish blackberry, 1/3 to ¼ of an inch long, maturing about September.

PREFERRED HABITAT.—Exposed high mountain slopes and cañon sides. In dry rocky soil and sometimes in crevices of rocks.

RANGE.—Idaho, southeastern Washington, and eastern Oregon to southern California.

THE Western Juniper is a tree of the high mountains, where it battles with the mighty winds and deep snow. The environment in which it lives has affected it, for its crown is open, round-topped, and extends to within a few feet of the ground, and its trunk is short and thick. Rarely is there more than 4 to 8 feet of clear trunk on any tree. This stubby or chunky appearance is very distinctive.

The fierce winds common to the habitat of this tree check its growth in height, but develop enormously large roots which enable it to anchor itself securely to the soil.

Some of the principal distinguishing characteristics of this tree are its bluish-black berry-like fruit, and its short, pale ashy-green, scale-like leaves, prominently marked on the back with glandular pits often filled with resin.

The thin, scaly, stringy, and reddish-brown bark and the pale brown wood, tinged with red, are also distinctive. The wood is similar to that of the Eastern Red Cedar, and it is quite probable that as it becomes better known it will also be used in the manufacture of lead pencils.

THE WILLOW FAMILY

SALICACEÆ

THE Willow Family comprises about 200 representatives, of which number 175 are Willows, and the remaining twenty-five Poplars or Aspens. Scientists may yet find evidence of a common ancestor of these two groups, for they are closely related.

The members of this family comprise both trees and shrubs which are found chiefly in the north temperate and Arctic zones. A few shrubby species extend far into the Arctic regions, and may be classed among the most boreal of our woody plants.

The flowers both of the Willows and Poplars appear early in spring, usually before the leaves begin to develop. The pollen-bearing (male) and seed-bearing (female) flowers always occur on different trees. A Willow or Poplar tree bearing male blossoms invariably will not have female flowers upon it. Consequently seed is produced only upon trees producing seed-bearing (pistillate) flowers.

Both the pollen-bearing and seed-bearing flowers are arranged in tassels, technically known as aments or catkins. The pollen-bearing flowers of many families of trees are so arranged, but in no other family do both kinds of flowers appear in drooping tassels.

All who have traveled in the out-of-doors in early springtime must have seen the "pussy buds," as the children call them. They are among the most beautiful objects of springtime, and are nothing other than the developing flower tassels of the Willows.

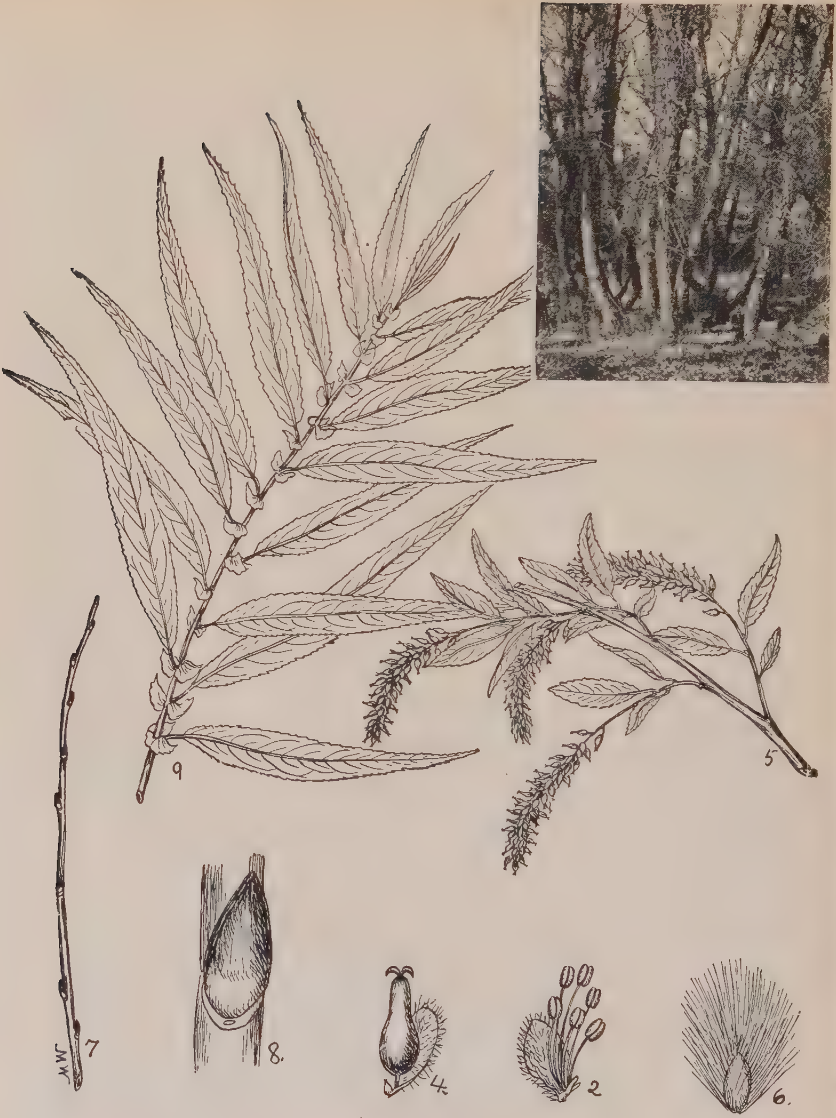
Both the Willows and Poplars are noted for their remarkable ability to grow from root and shoot cuttings. One may cut a short section of a twig, place it in moist ground, and feel assured that it will develop into a tree. This method of reproduction is used almost exclusively in the propagation of Willows to supply rods for the manufacture of baskets and furniture.

Few trees possess such a tenacious vitality as the Willows. They live for a long time after they seem to be dying, and repair damaged parts rapidly. They also reproduce freely. On very wet situations they often form dense thickets to the exclusion of almost all other woody growth.

One of the outstanding features both of the Poplars and Willows is the fact that they are well equipped to scatter their seeds. The seeds are very light, produced in great numbers, and furnished with a dense covering of long hairs which aid in their dispersal. No other group of trees is more abundant upon burnt-over areas in the northeast than the Aspens. I counted 24,792 specimens of Trembling Aspen (one to fifteen feet high) upon one acre of recently burnt-over mountain land in northern Pennsylvania. They spring up by the millions immediately after a forest fire, and in many localities take complete control of the situation. They, however, are short-lived, and, as a rule, are soon replaced by more permanent trees.

Summer or winter, day or night,
The woods are an ever-new delight;
They give us peace and they make us strong,
Such wonderful balms to them belong:
So living or dying, I'll take mine ease
Under the trees, under the trees.

Photo by U. S. Forest Service



BLACK WILLOW

2 = A staminate flowering branch; 4 = a pistillate flower, enlarged; 5 = a fruiting branch; 6 = a seed with hairs, enlarged; 7 = a winter twig; 8 = section of a winter twig with bud and leaf-scar enlarged; 9 = a leafy branch

BLACK WILLOW

SALIX NIGRA *Marshall*

FAMILY.—Willow.

GENERAL DESCRIPTION.—*Shape:* broad, symmetrical, round-topped. *Height:* 25 to 30, sometimes 80 feet. *Bark:* thick, deeply furrowed, blackish-brown. *Buds:* small, 1/8 of an inch long, sharp-pointed, covered by a single reddish-brown scale. *Leaves:* alternate, simple, very narrow, 3 inches long, sharp-pointed, finely toothed on margin, dark green above, pale green below. *Flowers:* appear in March or April before the leaves; pollen-bearing and seed-bearing occur on separate trees; both are arranged in drooping tassels about 3 inches long. *Fruit:* a small, smooth, reddish-brown capsule containing many small seeds bearing a tuft of hairs at one end.

PREFERRED HABITAT.—Moist to wet and open situations.

RANGE.—New Brunswick to Florida, west to Dakotas, California, and southern Arizona.

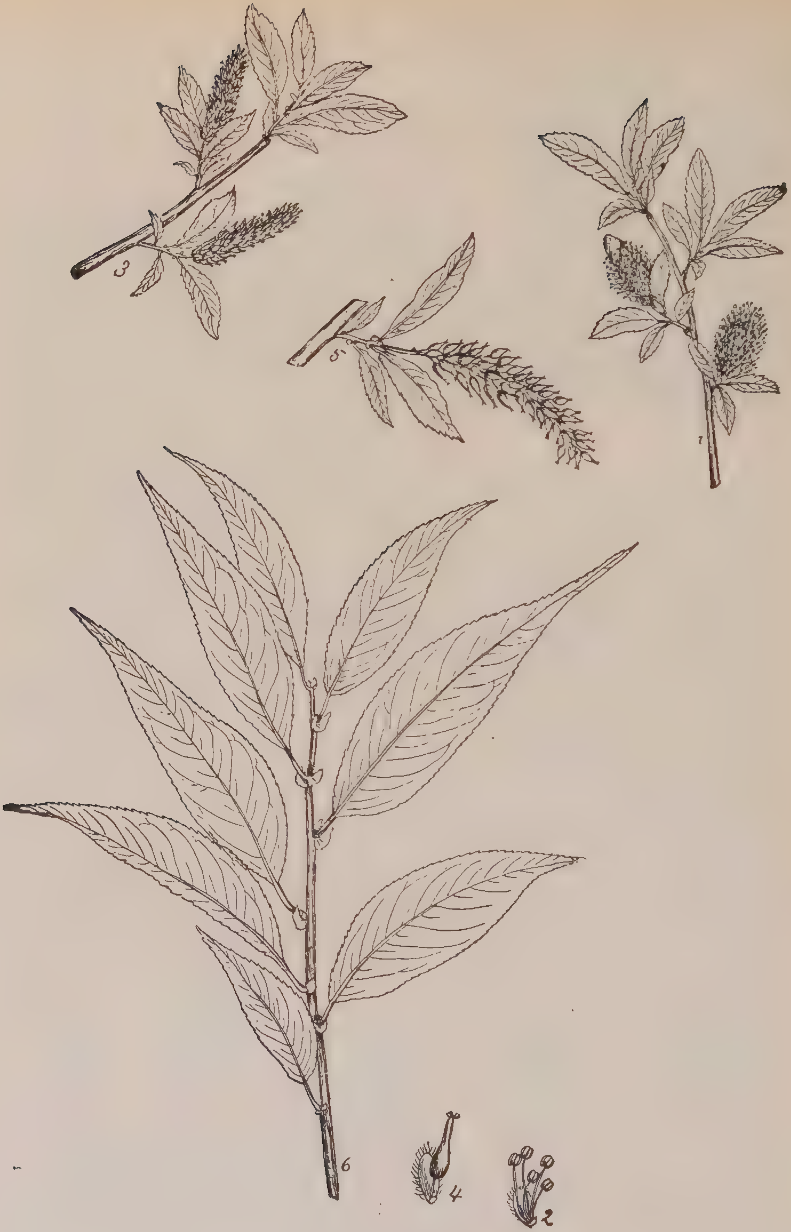
THE Black Willow is unquestionably the most important Willow from a lumberman's point of view. It has a wider distribution and attains a greater size than any other native Willow.

It may be distinguished by its long, narrow, sharp-pointed leaves, which are often bent in a slightly sickle-shaped fashion. They are dark green upon the upper surface and somewhat paler on the lower side. At the base of the rather short petiole there is attached a pair of round leaf-appendages (stipules), which apparently clasp the twig. The almost black, furrowed and flaky bark is a distinguishing characteristic during all seasons.

If a forest-grown Willow of large size is found, one is quite safe in calling it Black Willow, for it is the only native species which sometimes exceeds 100 feet in height and reaches a diameter of three feet.

The wood of the Black Willow is pale reddish-brown in color, and weighs about twenty-eight pounds per cubic foot. It is used chiefly in making boxes, excelsior, veneer, charcoal, powder, and artificial limbs.

Among the other native Willows which may attain small tree size are the Shining Willow and the Glaucous or Pussy Willow.



SHINING WILLOW

SHINING WILLOW

SALIX LUCIDA *Muhlenberg*

FAMILY.—Willow.

OTHER NAME.—Glossy Willow.

GENERAL DESCRIPTION.—*Shape:* short-trunked, with a symmetrical, broad crown. *Height:* 10 to 15, sometimes 25 feet. *Bark:* smooth, thin, bitter, brown to reddish brown. *Buds:* alternate, smooth, about ¼ of an inch long, covered by a single yellowish-brown scale. *Leaves:* alternate, simple, long-pointed at apex, finely toothed on margin; smooth and very shiny above and pale below. *Flowers:* appear about April, arranged in tassels from one to two inches long. *Fruit:* a smooth-stalked, straw-colored, pale-brown capsule.

PREFERRED HABITAT.—Wet situations. Common along streams, on islands, and in boggy places.

RANGE.—Newfoundland to Manitoba, south to Pennsylvania, and west to Kentucky and Nebraska.

THE Shining Willow is common in wet situations, where it may be found in the form of a shrub or small tree. It can readily be distinguished by its shining leaves, which are lanceolate to ovate in outline. Its leaf-stalks, marked with glandular dots, are also distinctive.

In wintertime the shining brownish or yellowish twigs are a positive means of identification, and in early summer the smooth fruiting capsules are helpful in recognizing it, while in early spring the pollen-bearing flowers with five stamens are distinctive.

Both in its natural haunts and artificial environments it is one of the most beautiful of our small willows. Its glossy foliage is its special charm. It deserves a place of honor on the home grounds, because of its attractive appearance and the ease with which it is transplanted.

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1 = A staminate flowering branch; 2 = a staminate flower, slightly enlarged; 3 = a pistillate flowering branch; 4 = a pistillate flower, slightly enlarged; 5 = section of a fruiting branch; 6 = a branch with mature leaves

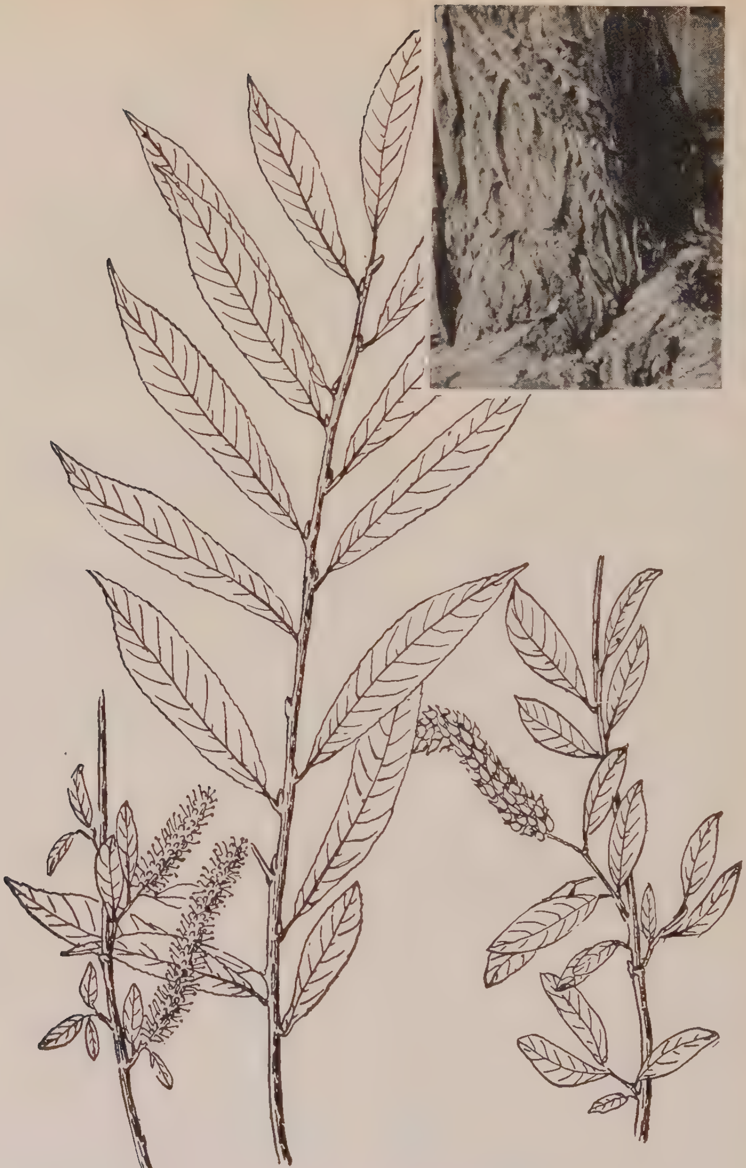


Photo by U. S. Forest Service

Courtesy of "Indiana Trees"

WHITE WILLOW

WHITE WILLOW

SALIX ALBA *Linnæus*

FAMILY.—Willow.

OTHER NAMES.—Yellow Willow; Blue Willow.

GENERAL DESCRIPTION.—*Shape:* short-trunked, usually branches near the ground, and bears a spreading, irregular, round-topped crown. *Height:* 50 to 80 feet, with a diameter up to 3 feet. *Bark:* smooth, yellowish, becoming thick, rough, and dark ashy-gray on old trunks. *Buds:* alternate, blunt-pointed, covered with a single scale and placed against the stem. *Leaves:* alternate, simple, 2 to 5 inches long, ½ to 1 inch broad, and finely-toothed on margin. *Flowers:* appear early in spring and are grouped in drooping tassels; pollen-bearing and seed-producing, occur on different trees. *Fruit:* an ovoid, conical capsule, arranged in drooping tassels.

PREFERRED HABITAT.—Moist to wet situations; common along banks of streams and in meadows.

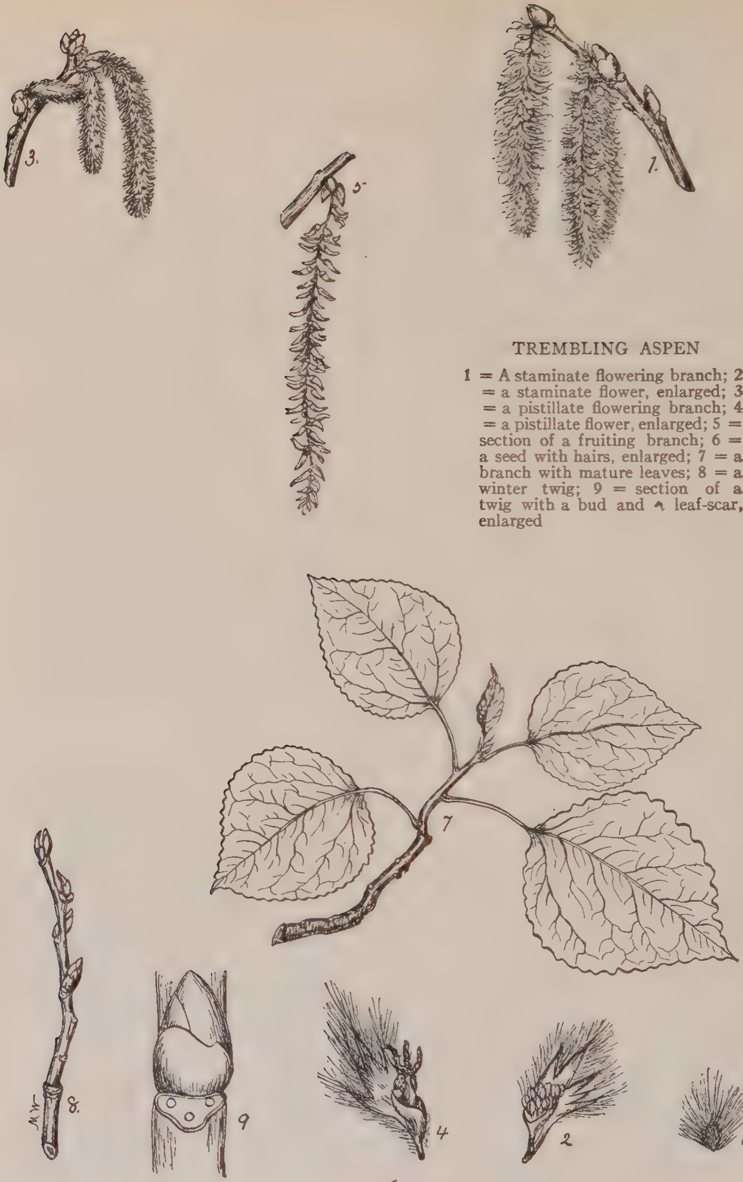
RANGE.—Native to Europe. Introduced early in the United States. Now found widely throughout the East and the Middle West.

THE White Willow is really a native of Europe but it was introduced early into the United States. For generations it has been associated with the country landscape of New England, and is now widely distributed throughout the East and the Middle West. The White Willow is commonest along the banks of streams and other wet places. Its chief beauty and probably the most striking distinguishing characteristic are its dancing leaves, which are silky and pale on the lower surface. Whenever the slightest breeze blows the landscape is fairly illuminated, for the silvery-white lower surface of the leaf stands in such strong contrast with the dark-green upper surface.

In winter the yellowish twigs, dark ashy-gray bark, and the irregular crown are positive distinguishing characteristics. In fact, the White Willow has a rather ugly general appearance in winter. It is not unusual to find pollarded specimens, that is, trees with their crowns cut off completely. Such specimens often appear rather attractive in summer, but when devoid of foliage in winter are very unsightly. Pollarded trees, as a rule, throw out a cluster of rather long, straight sucker branches about the base of the trunk.

The White Willow has no special commercial value. Its wood is weak and soft, but its twigs are fairly valuable for basket-making. This tree's chief value lies in its ability to bind soil along streams, and as a beautifier of marshy meadows and pasture lands.

Most of the large Willows which one sees about human habitations are foreigners. They were introduced from other lands. Three of the commonest introduced Willows are White Willow, Weeping Willow, and Crack Willow. The Weeping Willow, the favorite tree of the Orient, has



TREMBLING ASPEN

1 = A staminate flowering branch; 2 = a staminate flower, enlarged; 3 = a pistillate flowering branch; 4 = a pistillate flower, enlarged; 5 = section of a fruiting branch; 6 = a seed with hairs, enlarged; 7 = a branch with mature leaves; 8 = a winter twig; 9 = section of a twig with a bud and a leaf-scar, enlarged

been planted extensively in the eastern United States, and may be recognized by its erect habitat and its long, drooping, and graceful branches.

The Crack Willow usually occurs along the banks of streams or in other wet situations, and may be recognized by its branches, which crack off very easily. After a storm one usually finds the ground beneath a Crack Willow covered with broken branchlets.

Trembling Aspen

Populus tremuloides (*Michaux*)

Family.—Willow.

Other Names.—American Aspen; Quaking Aspen; Small-toothed Aspen; Popple; Poplar; Aspen.

General Description.—*Shape:* high and narrow crowned, often round-topped. *Height:* 30 to 40, sometimes 80 feet. *Bark:* white to yellowish-green, smooth and close-fitting; on old trunks rough and black. *Buds:* narrow, conical, sharp-pointed, smooth, shiny, covered with 6 or 7 reddish-brown scales. *Leaves:* alternate, simple, nearly round, finely toothed on margin; leaf-stalks flattened laterally. *Flowers:* appear early in spring; pollen-bearing and seed-bearing occur on different trees; both are arranged in slender, drooping tassels. *Fruit:* a two-valved capsule containing small seeds surrounded with tufts of hairs.

Preferred Habitat.—Found on practically all kinds of soil except in swamps.

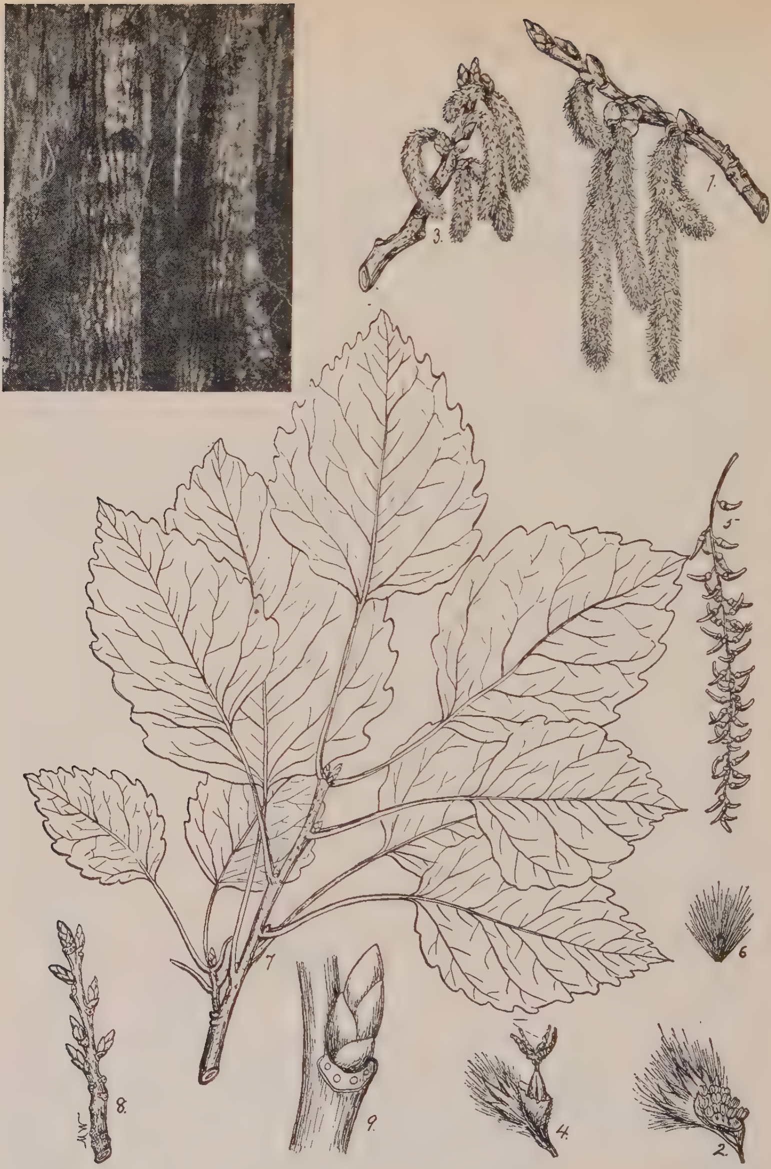
Range.—A transcontinental species, extending from Newfoundland to Alaska, and south to Kentucky and Mexico.

If trees had human characteristics, the Aspens would be the pioneers of the forest community, for they open the way for other trees in the course of forest succession. Like a mighty army they march along and cover the bare soil left in the wake of destructive forest fires.

The Trembling Aspen has the widest range of any tree native to North America. It is a transcontinental species, extending from Newfoundland to the Hudson Bay region and Alaska, south to Pennsylvania, and along the mountains to Kentucky, and west through the Rocky Mountains to California and Mexico.

The trembling foliage is the most distinctive character of the tree. In summer one may distinguish the Trembling Aspen by its ovate to nearly round leaves, with finely toothed margins; and in winter the sharp-pointed, conical, and often uncurved buds, with an apparent coating of varnish, are characteristic.

The bark is also a helpful means of identification. It changes with the weather and climate. In the Rocky Mountain region and the far north the bark on small trunks is almost white, while in lower situations yellowish-green appears to be the prevailing color. Nothing is more impressive than to watch the changing color of the bark. As soon as it becomes wet it changes from a yellowish-green to a deep olive green, which is one of the most beautiful colors in nature.



LARGE-TOOTHED ASPEN

1 = A staminate flowering branch; 2 = a staminate flower, enlarged; 3 = a pistillate flowering branch; 4 = a pistillate flower, enlarged; 5 = a fruiting catkin with capsules; 6 = a seed with hairs, enlarged; 7 = a branch with mature foliage; 8 = a winter twig; 9 = section of a winter twig, enlarged

LARGE-TOOTHED ASPEN

POPULUS GRANDIDENTATA *Michaux*

FAMILY.—Willow.

OTHER NAMES.—Popple; Poplar; Aspen.

GENERAL DESCRIPTION.—*Shape:* long slender trunk, bearing an irregular, shallow crown. *Height:* 30 to 40, sometimes 70 feet, with a diameter of 2 feet. *Bark:* on old trunks thick, rough, blackish and hard; elevated surface between furrows smooth. *Buds:* alternate, egg-shaped to conical, pointed, dusty-dull, covered by 6 to 7 chestnut-brown scales. *Leaves:* alternate, simple, broadly egg-shaped, 3 to 4 inches long, coarsely-toothed on margin; leaf-stalk flattened laterally. *Flowers:* appear about April, pollen-bearing and seed-producing occur on different trees; pollen-bearing, arranged in drooping tassels, 1½ to 2½ inches long; seed-producing arranged in drooping tassels 1½ to 2½ and sometimes 4 inches long. *Fruit:* a conical 2-valved capsule borne on a drooping stalk about 4 inches long.

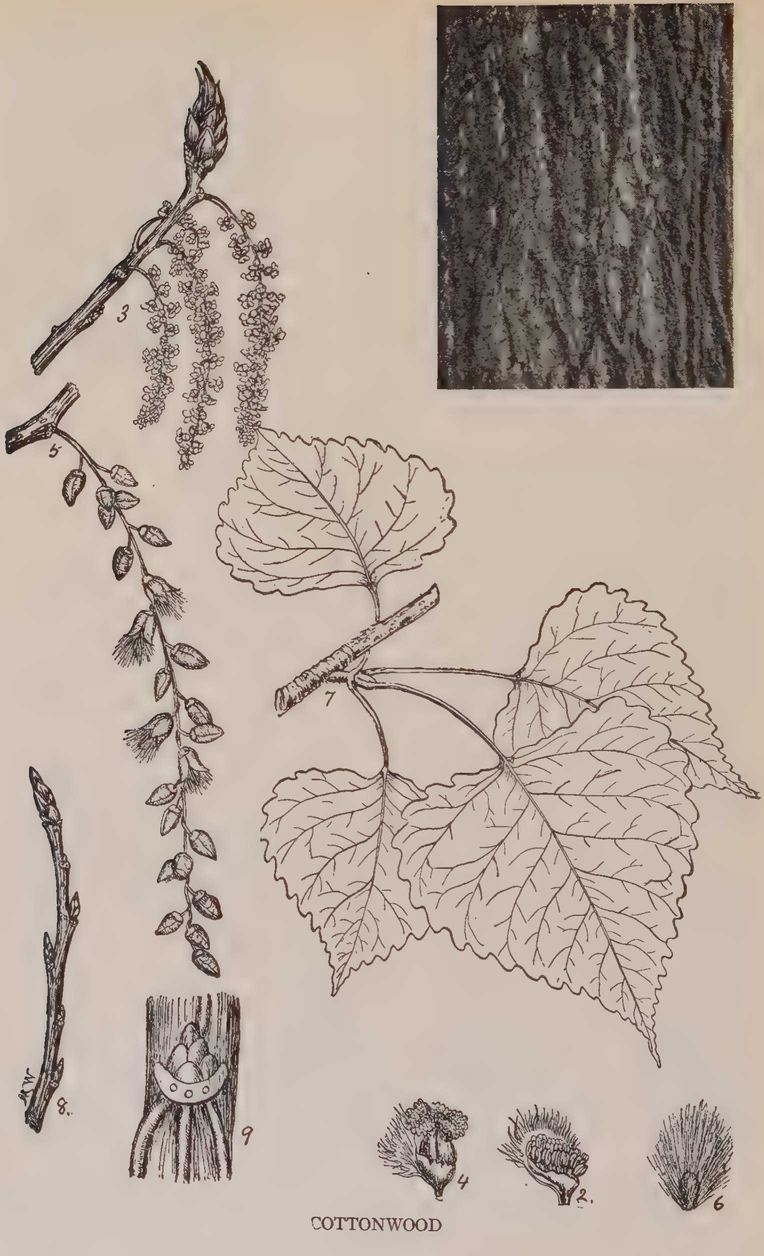
PREFERRED HABITAT.—Rich, moist soil; also found upon dry, gravelly situations, in abandoned fields, on cut-over areas, and forest fire burns.

RANGE.—Nova Scotia and Ontario to Minnesota, south to Pennsylvania, and along the mountains to North Carolina.

THE Large-toothed Aspen is a tree of the Northwoods but extends southward along the Allegheny Mountains to North Carolina. In summer, the Large-toothed Aspen may be distinguished by its medium-sized leaves with coarsely-toothed margins and vertically flattened leaf-stalks, which give the leaves considerable freedom of motion. The leaves of sucker shoots which spring up from underground roots are larger than normal, and usually densely coated with hairs on the lower surface.

The Large-toothed Aspen may be recognized with little difficulty in winter. Only the Trembling Aspen resembles it closely, and these two common trees have striking distinguishing characteristics. The buds of the Large-toothed Aspen are stout, blunt-pointed, divergent, and covered with a flour-like, crusty, woolly substance, while those of the Trembling Aspen are slender, sharp-pointed, smooth, glossy, and closely appressed to twigs. The twigs of the Large-toothed Aspen are yellowish-brown, and pale-downy or pale-scaly, and its lateral branches are less ascending than those of the Trembling Aspen.

The dark-gray, hard, and thick bark, roughened by short, vertical, blackish furrows, is a helpful distinguishing characteristic at all seasons of the year. The large-toothed Aspen is not a valuable timber tree, but it should be protected, for it produces valuable pulp-wood and helps restore a forest growth upon burnt-over and lumbered areas.



COTTONWOOD

COTTONWOOD

POPULUS DELTOIDES *Marshall*

FAMILY.—Willow.

OTHER NAMES.—Carolina Poplar; Cotton Tree; Whitewood.

GENERAL DESCRIPTION.—*Shape:* a long clean trunk bearing a high pyramidal crown. *Height:* 50 to 75, sometimes 100 feet, with a diameter of 6 feet. *Bark:* on old trunks ash-gray, roughened by long deep furrows; on younger trunks thin, smooth, and greenish-yellow. *Buds:* alternate, smooth, glossy, resinous, chestnut-brown; terminal buds often 5-angled, and larger than lateral ones; lateral buds usually divergent and often recurved. *Leaves:* alternate, simple, broadly deltoid, sharp-pointed at apex, coarsely-toothed on margin, 3 to 5 inches long; leaf-stalks flattened laterally. *Flowers:* appear in March or April; pollen-bearing and fruit-producing occur on different trees; pollen-producing, occur in drooping tassels, 3 to 4 inches long and densely flowered; fruit-producing, occur in drooping tassels 2½ to 3½ inches long and sparsely flowered. *Fruit:* a dark green, 3 to 4 valved capsules containing many small seeds arranged in drooping tassels which may become 8 to 12 inches long.

PREFERRED HABITAT.—Rich, moist soil; common on banks of streams, borders of lakes and swampy situations.

RANGE.—Quebec and Ontario to Florida and west to Rocky Mountains.

THE Cottonwood is probably the commonest planted tree in the Great Plains region of the Middle West. In the more eastern part of its range it is neither so common nor does it reach so large a size as in the Mississippi Valley.

The Cottonwood, more frequently called Carolina Poplar, can readily be distinguished at any season of the year by its ashy-gray bark, roughened by deep furrows which usually parallel each other but are often connected, by its lateral branches which have a tendency to take a rather upright position, and by its yellowish stout twigs which have prominent ridges running down from the leaf-scars.

The buds are larger, more resinous, and more flattened than those of other Poplars and Aspens, and they usually stand out from the twigs and are conspicuously incurved.

The leaves are very distinctive. They are evidently deltoid in outline, straight-based, and long-pointed at apex. The leaf-stalks are flattened laterally. The young shoots are greenish to brownish, often striped lengthwise or spotted with grayish dots.

Reliable records show that this tree has grown 5 feet in height in a single year and 40 feet in 10 years. It cannot be recommended for street planting, for its roots lift pavements and clog drains and sewers.

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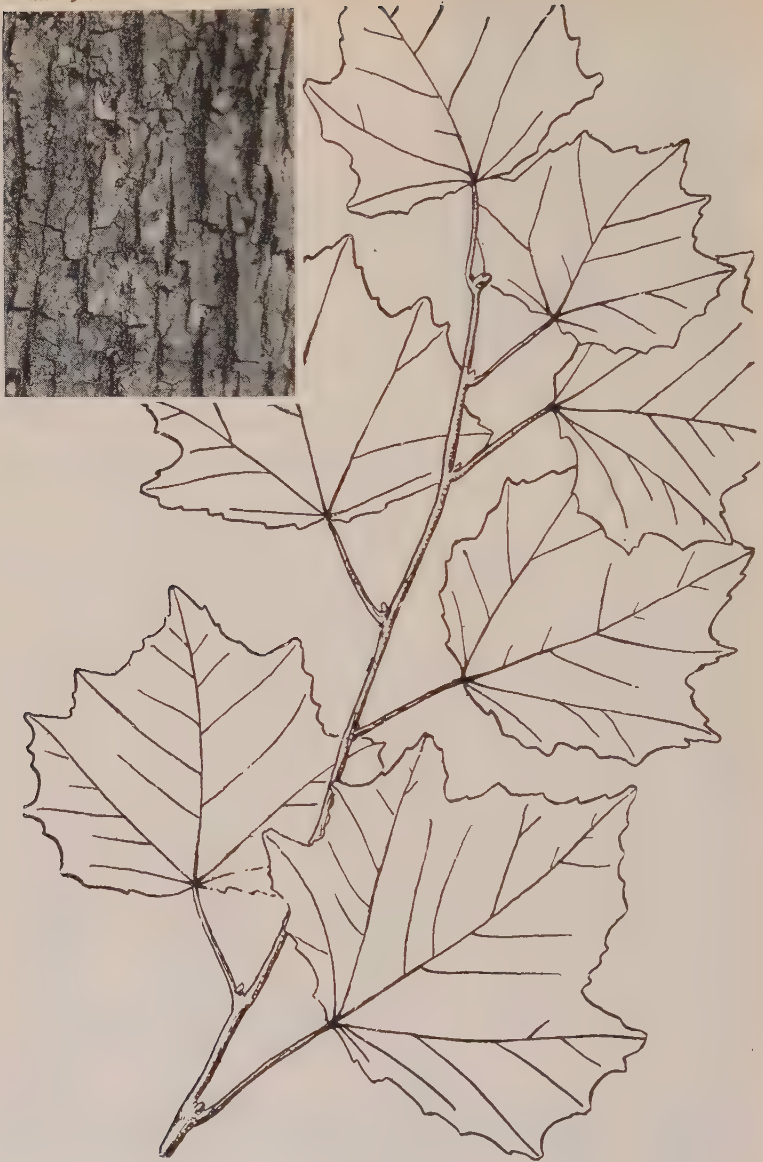
2 = A staminate flower, enlarged; 3 = a pistillate flowering branch; 4 = a pistillate flower, enlarged; 5 = section of a branch with a fruiting catkin and capsules; 6 = a seed with hairs, enlarged; 7 = section of a branch with mature foliage; 8 = a winter twig; 9 = section of a winter twig, enlarged.

Photo by U. S. Forest Service



SILVER POPLAR *Courtesy of "Indiana Trees"*

SILVER POPLAR

POPULUS ALBA *Linnæus*

FAMILY.—Willow.

OTHER NAMES.—White Poplar; Silver-leaf Poplar.

GENERAL DESCRIPTION.—*Shape:* a medium-sized tree with a stout trunk bearing a large, irregular, broad, round-topped crown. *Height:* 40 to 60, sometimes 75 feet. *Bark:* on old trunks deeply furrowed into firm, dark ridges; on young trunks and large branches, smooth, light greenish-gray or whitish, often dotted with dark blotches. *Buds:* small, egg-shaped to conical, light chestnut-brown, more or less covered with cottony wool. *Leaves:* alternate, simple, coarsely-toothed, often 3 to 5-lobed, very dark green on upper surface and glistening white on lower surface. *Flowers:* appear early in spring; pollen-bearing and seed-producing arranged in drooping tassels from 1½ to 4 inches long. *Fruit:* a 2-valved capsule borne on a drooping stalk from 2 to 4 inches long.

PREFERRED HABITAT.—Rich, moist soil, but will grow on a wide range of situations.

RANGE.—Native of the Old World. Introduced from England by the early settlers, and soon established in many towns of New England. Now found throughout the East from New Brunswick and Nova Scotia to Virginia.

THE White Poplar is native to both Europe and Asia. It is now distributed widely throughout the eastern United States.

The most striking distinguishing characteristic of the Silver Poplar is the marked difference in color between the lower and the upper surfaces of its leaves. The upper side is very dark green and glossy, which when shadowed is almost black, while the lower surface is a glistening white, which shows up in a very striking manner when the wind blows violently. This silvery pubescence is not confined by any means to the lower surface of the leaves, for in winter one can distinguish this tree from all others with which it is associated by the dense cottony covering found upon the twigs and buds.

The Silver Poplar, just as all other Poplars, produces its pollen-bearing and seed-producing flowers on different trees. The flowers emerge from the large flower buds very early in spring, and develop into drooping tassels. The cottony seeds mature in several weeks, and are then scattered far and wide by the wind, because of their light weight and numerous hairs which are attached to them.

The Silver Poplar is common about towns and abandoned building sites. It is a very rapid-growing tree, but unfortunately becomes defective before it is old. It is not recommendable for extensive ornamental planting.

THE WALNUT FAMILY

JUGLANDACEÆ

THE Walnut Family is one of the most important of those having tree representatives in North America. It comprises six different groups of trees and shrubs having a total membership of about thirty-five species, found chiefly in the warmer portion of the north temperate zone.

The two most important groups of trees belonging to this family are the Walnuts and Hickories, both of which yield valuable wood and edible nuts. These two important groups may be distinguished from each other by the following characteristics:

WALNUTS	HICKORIES
1. Pith of twigs chambered.	1. Pith of twigs continuous.
2. Nuts rough and sculptured.	2. Nuts smooth or ridged.
3. Husk of fruit does not split.	3. Husk of fruit splits into valves.
4. Tassels of pollen-bearing flowers are thick, compact, not stalked, and occur singly.	4. Tassels of pollen-bearing flowers are slender, flexible, stalked, and occur in threes.
5. Wood light brown to dark brown; pores scattered rather evenly throughout growth ring.	5. Wood white to reddish-brown; large pores arranged in concentric rings.

There are fifteen different kinds of Walnuts known in the world, five of which are native to North America. Two of these—Black Walnut and Butternut—are found in the eastern United States.

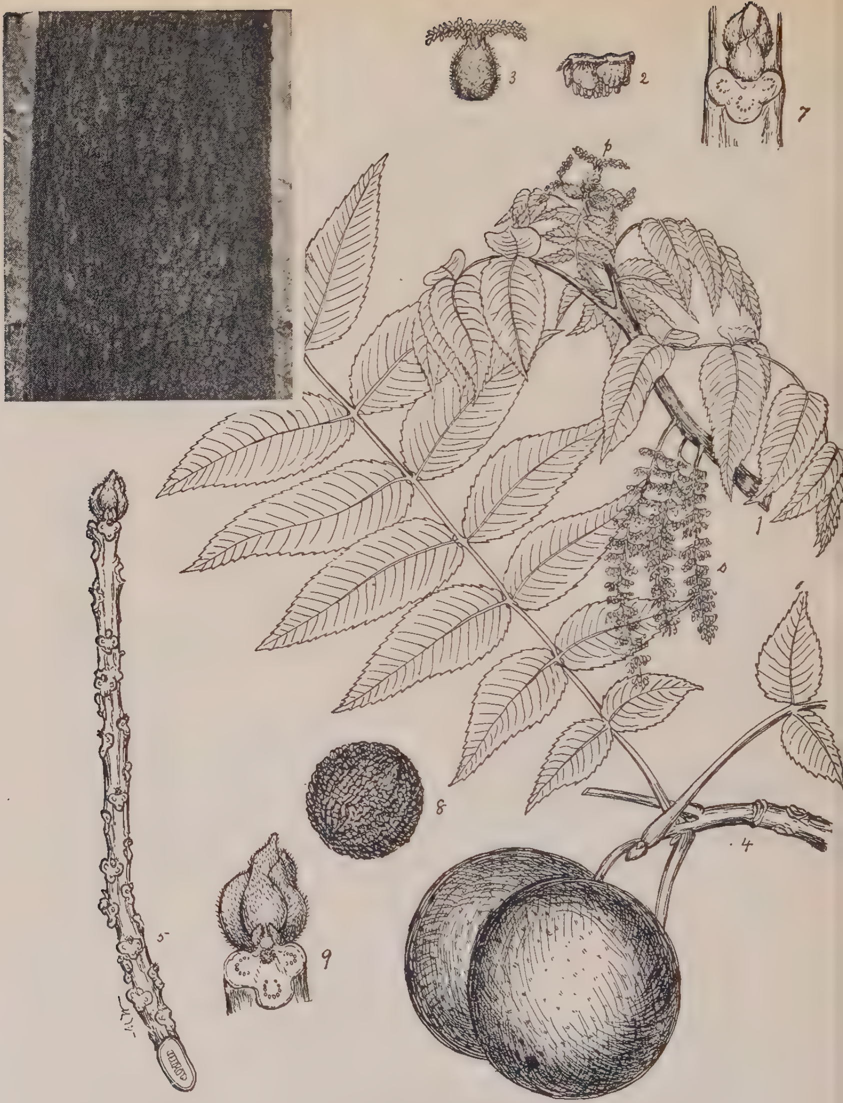
In addition to the native Walnuts, the English Walnut, native to southern Europe, is distributed widely in the United States as a nut and ornamental tree. This tree yields the valuable Circassian Walnut wood of commerce, used so extensively in the manufacture of furniture.

All but one of the eleven known species of Hickory are native to that part of North America which lies east of the Rocky Mountains. Geological records inform us that the Hickories originally extended into Greenland, and were found in Europe. To-day no native species occur there. The belief is prevalent that they were destroyed during the ice age, and have not been able to re-establish themselves.

The Hickories are among our most important timber trees. They maintain an important position not on account of the large quantity, but the special quality of wood which they produce. The wood is used for special purposes, for which no satisfactory substitute has yet been found. It is strong, moderately light in weight, extremely elastic, and used extensively for handles and in the manufacture of wagons, carriages, and other vehicles.

The nuts of some of the Hickories are edible. They were used by the Indians for food and oil, and at the present time the nuts of the Shell-bark, Shag-bark, and Pecan Hickories are important articles of commerce. The nuts of the Pignut and Swamp Hickories are not edible, but in the South they are used in large quantities to fatten hogs.

Plant oak or ash on useless spots of ground,
A birch or willow at the murmuring brook;
Some flowering shrub upon the grassy mound
Or useful tree in any vacant nook.
The graceful maple and the fragrant pine
On school-house grounds where children love to play
Some hardy trees along the highway's line
To shade the traveler on his tiresome way.



BLACK WALNUT

1 = Branch with developing leaves and (s) three solitary catkins of staminate flowers and (p) a spike with three pistillate flowers; 2 = a staminate flower, slightly enlarged; 3 = a pistillate flower, slightly enlarged; 4 = a branch with a mature leaf and fruit; 5 = a winter twig; 7 = section of twig showing superposed and gaping buds, and leaf-scars and three clusters of bundle-scars and notched upper surface, slightly enlarged; 8 = a nut with husk removed; 9 = terminal section of winter twig showing leaf-scar and terminal bud with bud-scales, slightly enlarged

BLACK WALNUT

JUGLANS NIGRA *Linnæus*

FAMILY.—Walnut.

OTHER NAMES.—Walnut; Walnut-tree.

GENERAL DESCRIPTION.—*Shape:* crown broad and round-topped. *Height:* 80 to 100, sometimes 150 feet. *Bark:* thick, rough, furrowed, dark brown to grayish-black. *Buds:* terminal bud flattened, ¼ to ½ of an inch long, grayish-brown and hairy; lateral buds round, 1/6 of an inch long, grayish-brown and hairy. *Leaves:* alternate, compound, with 13 to 23 leaflets. *Leaf-scars:* large, three-lobed, often heart-shaped, containing three groups of bundle-scars. *Flowers:* appear about May; pollen-bearing and seed-bearing are separate, but occur on same tree; the former are arranged in unbranched, drooping tassels, and the latter in 2 to 5 flowered clusters. *Fruit:* a sculptured nut with a fleshy non-splitting covering.

Preferred Habitat.—Rich, moist and deep soil. Requires plenty of light, and ample room for its long taproot.

RANGE.—New England to Minnesota, and south to Florida.

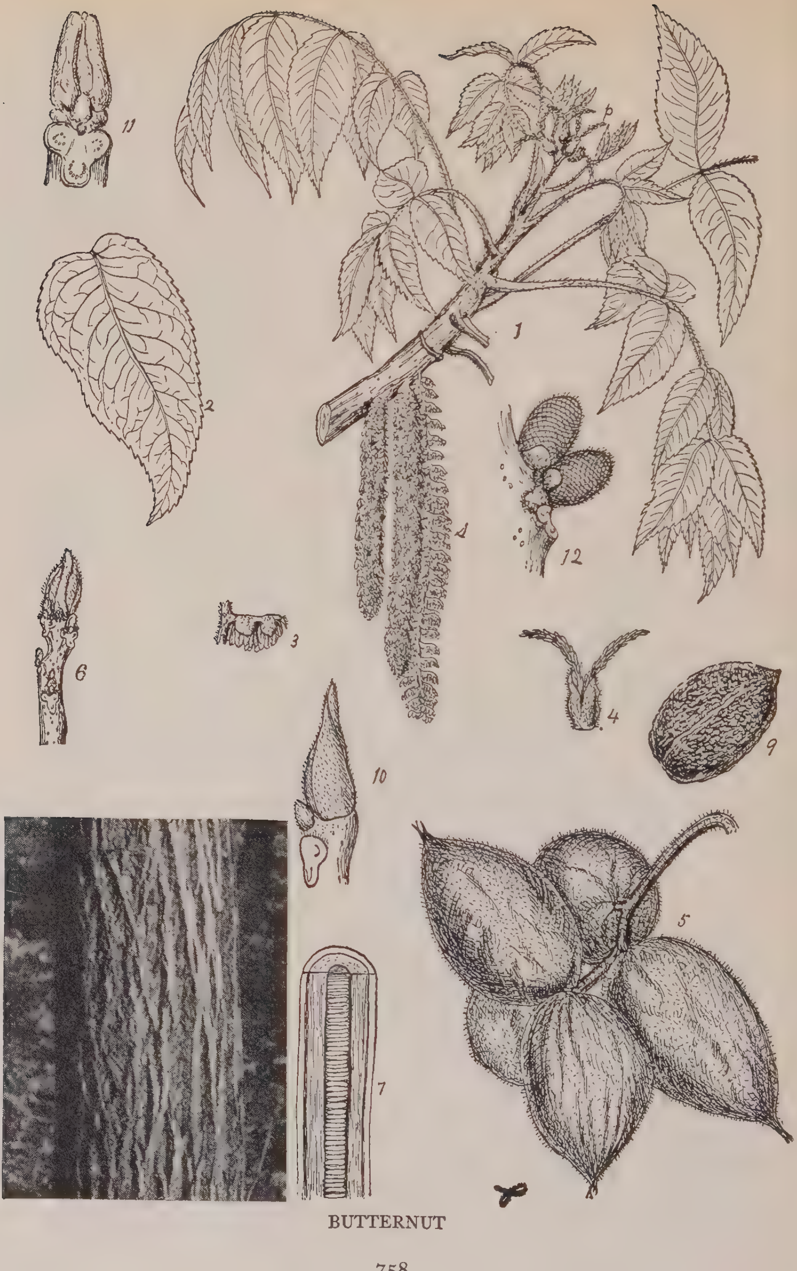
THE Black Walnut is more fortunate than most of its associates in that it has only a few common names. Throughout its entire range of 650,000 square miles it is called Walnut, Black Walnut, or Walnut-tree. The adjective *black* refers to the color of the wood and bark, and enables one to distinguish it easily from the closely related White Walnut, or Butternut.

The Black Walnut bears little resemblance to any other forest tree except the Butternut. These two trees may readily be distinguished from other forest trees by their rough and sculptured nuts, covered with a non-splitting husk, and their chambered pith. For distinguishing characteristics between the Black Walnut and the Butternut see the description under the latter species.

The wood of Black Walnut now brings the highest price of any of our native woods. It is no longer destroyed and wasted, but every available piece is collected and manufactured into some useful commodity. It is extensively used in the manufacture of furniture, sewing machines, musical instruments, and coffins. Large quantities are consumed at home and abroad for the manufacture of gun-stocks. Black Walnut was in great demand during the Civil War for gun-stocks, and during the recent World War fabulous prices were offered for almost any grade, much of it being used for making propellers for airplanes.

Much is now being done to perpetuate this tree in the way of planting nuts and seedlings.

The Black Walnut is the only tree that bears a close resemblance to the Butternut. These two trees may be distinguished from each other by the following characteristics:



BUTTERNUT

Black Walnut	Butternut
1. 13 to 23 leaflets to each leaf.	1. 11 to 17 leaflets to each leaf.
2. bark is dark brown to black.	2. bark is gray.
3. pith is light brown.	3. pith is dark brown.
4. nut is round.	4. nut is elongated.
5. husk of fruit is smooth.	5. husk of fruit is hairy and sticky.
6. terminal bud is as broad as long.	6. terminal bud is longer than broad.
7. No hairy fringe occurs above leaf-scar.	7. hairy fringe present above leaf-scar.

BUTTERNUT

JUGLANS CINEREA *Linnæus*

FAMILY.—Walnut.

OTHER NAMES.—White Walnut; Oil Nut.

GENERAL DESCRIPTION.—*Shape:* short-trunked, bearing a broad, round-topped and unsymmetrical crown. *Height:* 30 to 50, sometimes 80 to 100 feet, with a diameter of 4 feet. *Bark:* on young trunks smooth and light gray; on old trunks light gray, roughened by black fissures; inner bark bitter, becoming yellow on exposure. *Buds:* alternate, covered with dense pale down; terminal bud ½ to ¾ of an inch long, flattened and blunt-pointed; lateral buds egg-shaped, very blunt-pointed, often superposed. *Leaves:* alternate, 15 to 30 inches long, compound, with 11 to 17 leaflets. *Flowers:* appear about May; pollen-bearing, arranged in unbranched drooping tassels, 3 to 5 inches long; fruit-producing occur in 6 to 8 flowered spikes. *Fruit:* an elongated, egg-shaped, deeply sculptured nut covered with a non-splitting, fleshy husk.

PREFERRED HABITAT.—Rich, moist soil; common along fences, streams, and roads.

RANGE.—New Brunswick to Minnesota, south to Delaware and Arkansas, and along the mountains to Georgia.

THE Butternut is one of the best-known nut-bearing trees native to the eastern part of the United States. While it is attractive and thrives well in the forest, and along fences, streams, and roads, it cannot be depended upon for ornamental planting. Wherever planted, it develops a poor form, and dead branches soon disfigure its appearance.

The Butternut and the Black Walnut can be distinguished easily from

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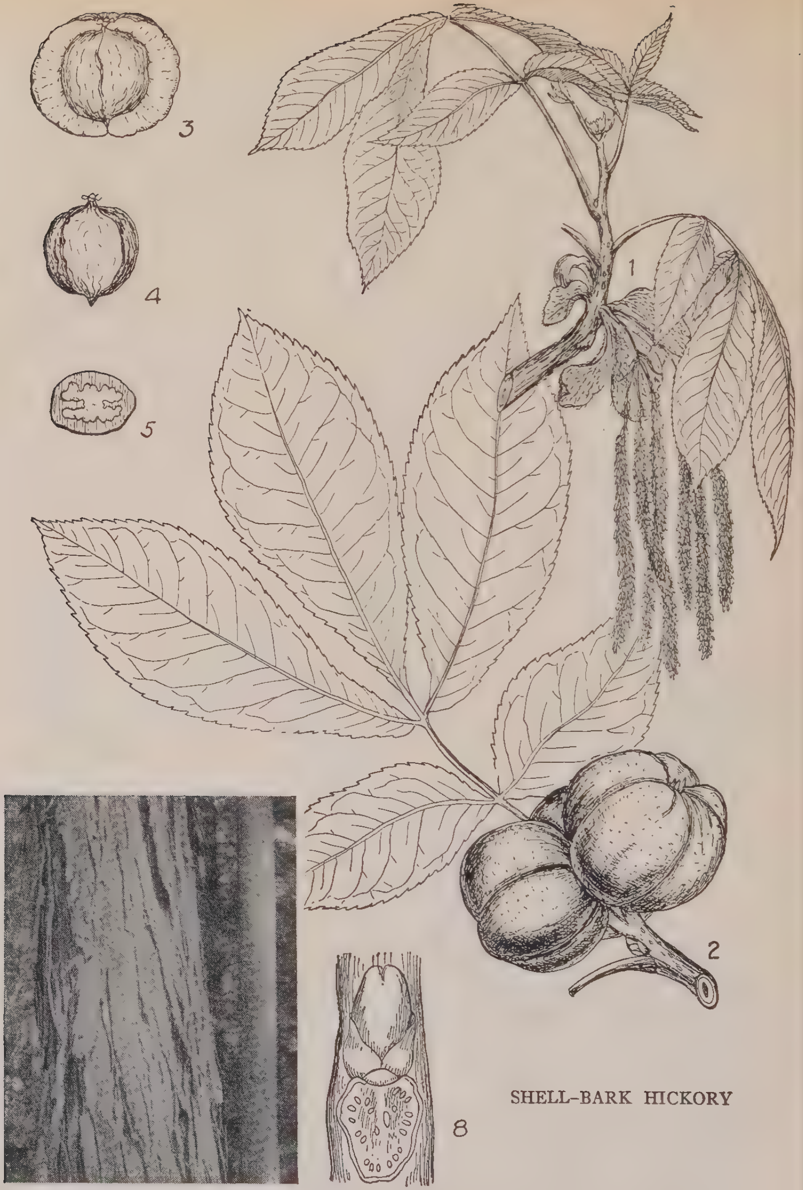
1 = Branch with one-half developed leaves, (s) three unbranched catkins of staminate flowers, and (p) a cluster of pistillate flowers; 2 = a mature leaflet; 3 = a staminate flower, slightly enlarged; 4 = a pistillate flower slightly enlarged; 5 = a cluster of mature fruit; 6 = a winter twig showing buds, lenticels, and leaf-scars; 7 = longitudinal section of twig showing chambered pith, slightly enlarged; 9 = a nut with husk removed; 10 = a terminal bud, natural size; 11 = a terminal bud (broad-side view), natural size; 12 = section of a branch showing superposed lateral flower buds, enlarged.



SHELL-BARK HICKORY

1 = A flowering branch; 2 = a branch with fruit and a mature leaf; 3 = a nut with part of husk removed; 4 = a nut; 5 = cross-section of nut showing kernel; 8 = section of a winter twig, showing lateral bud and leaf-scar, enlarged

the Hickories at any season of the year by their twigs, which contain a brown and chambered pith. The Hickories have a white and continuous pith, not broken up into compartments. The Butternut, Black Walnut, and Hackberry are the only three trees native to the eastern United States that have chambered pith.

SHELL-BARK HICKORY

CARYA OVATA (*Miller*) *K. Koch*

FAMILY.—Walnut.

OTHER NAMES.—Hickory; Shag-bark Hickory.

GENERAL DESCRIPTION. *Shape:* oblong-cylindrical and high. *Height:* 50 to 75, sometimes 120 feet. *Bark:* on old trunks shaggy and light gray; on young trunks smooth and grayish to reddish-brown. *Buds:* broadly egg-shaped, pointed, about 3/4 of an inch long, covered with 10 dark-brown and often hairy bud scales. *Leaves:* alternate, compound, with 5 to 7 leaflets. *Leaf-scars:* large, heart-shaped, contain numerous bundle-scars. *Flowers:* appear about May; pollen-bearing and seed-bearing occur separately, the former in drooping three-branched tassels and the latter in 2 to 5 flowered spikes. *Fruit:* a nut covered with a thick free-splitting husk.

PREFERRED HABITAT.—Rich, moist soil and plenty of light.

RANGE.—Quebec to Minnesota, south to Florida and Texas.

THE Shag-bark is the largest of the true Hickories. It is well-known throughout its entire range. Its wide acquaintance is due to the highly prized wood, shaggy bark, and delicious nuts which it produces.

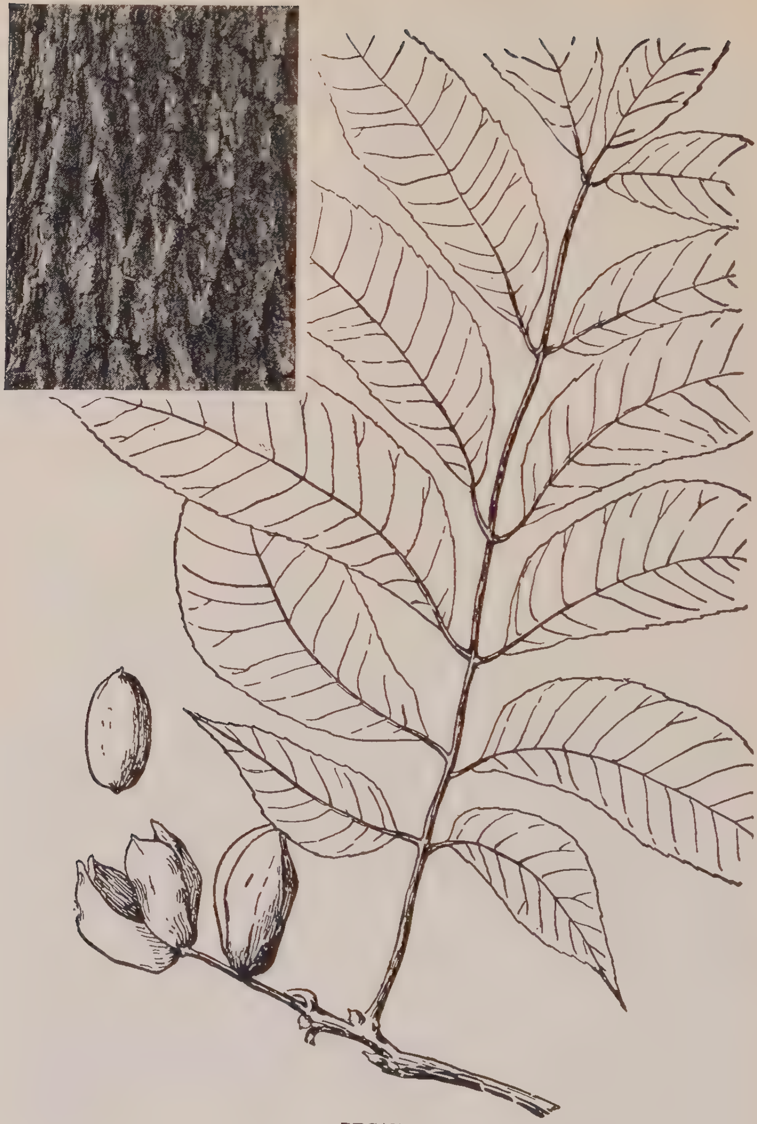
The Shell-bark Hickory is the most easily recognized of our Hickories. During all seasons of the year the larger trees may be recognized by the distinctly scaly bark of the trunk, which has given the tree the name Shag-bark and Shell-bark Hickory. When covered with foliage it may be distinguished by its rather large compound leaves, with usually five leaflets and a smooth leaf-stalk.

In winter the smooth reddish-brown twigs covered with white dots and bearing broadly egg-shaped buds with about ten grayish-brown bud-scales are helpful means of identification. In autumn the Shell-bark Hickory may be recognized by its fruit.

The wood is heavy, hard, strong, tough, elastic, and usually straight-grained. It weighs from fifty to fifty-two pounds per cubic foot, and is used extensively for handles and in the manufacture of vehicles.

The Shell-bark Hickory is an extremely important forest tree. It was originally found over about 1,000,000 square miles, but to-day it occurs on a more limited area. This tree is marching on toward extinction, and we should do everything possible to protect and propagate it.

Photo by U. S. Forest Service



PECAN *Courtesy of "Indiana Trees"*

PECAN

CARYA ILLINOENSIS (*Wangenheim*) *K. Koch*

FAMILY.—Walnut.

OTHER NAME.—Pecan Hickory.

GENERAL DESCRIPTION.—*Shape:* a tall, massive trunk bearing a narrowly symmetrical, broad, round-topped crown. *Height:* 80 to 100, sometimes 120 feet, with a diameter of 6 feet. *Bark:* light brown, tinged with red, tight-fitting, rather deeply furrowed, becoming somewhat scaly. *Buds:* alternate, covered with yellowish scales; lateral buds smaller than the terminal. *Leaves:* alternate, 12 to 20 inches long, compound, with 9 to 17 leaflets. *Flowers:* appear about May, when leaves are about half developed; pollen-bearing occur in drooping tassels arranged in clusters of three on a single stalk; fruit-producing occur on new growth in 2 to 5 flowered spikes. *Fruit:* an elongated, egg-shaped, reddish-brown nut, covered with a splitting husk, 1½ to 2 inches long; nuts occur in clusters of 3 to 11.

PREFERRED HABITAT.—Low, rich ground near streams.

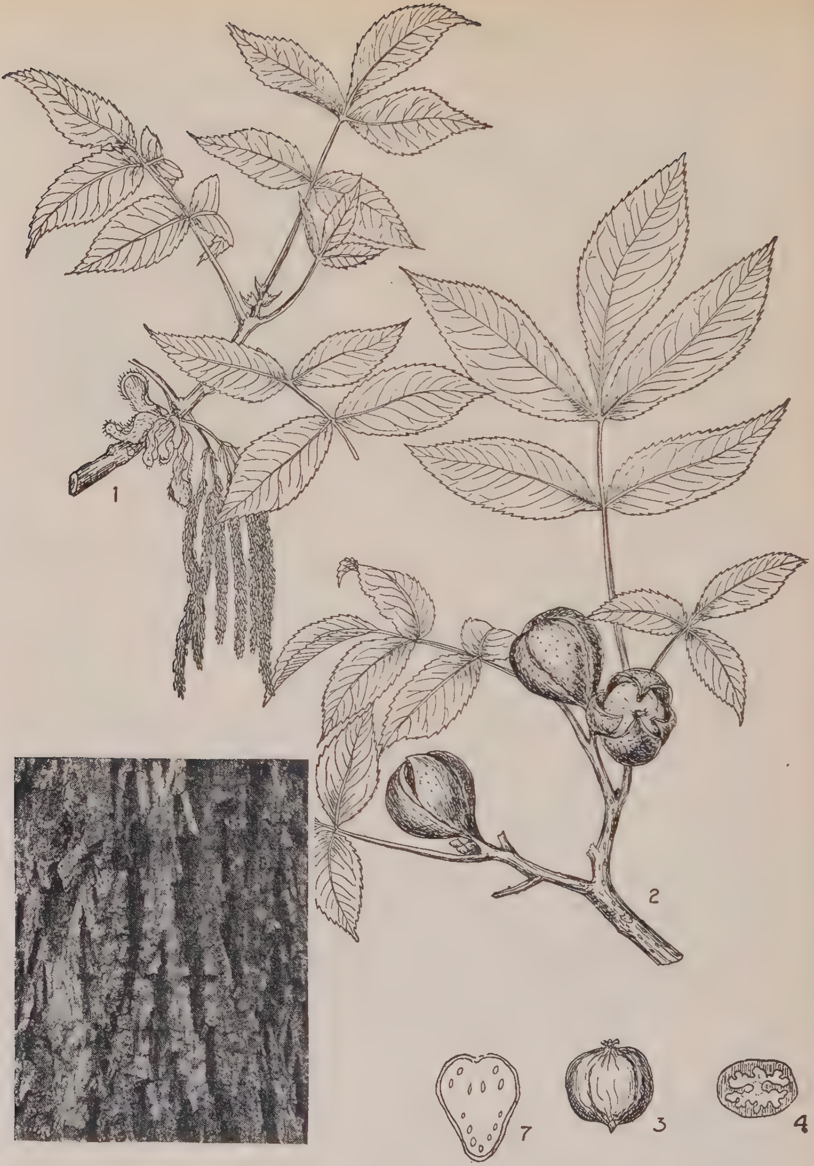
RANGE.—Iowa and Kansas to southern Illinois, south to Louisiana and Texas; most abundant and largest in southern Arkansas and eastern Texas.

THE Pecan is the most important nut-bearing tree native to the United States. The value of the nuts for food has long been recognized in the lower Mississippi Valley, where the tree is native. During the last 40 years great progress has been made in improving the size and quality of the nuts, and many commercial Pecan orchards have been established.

A mere glance at a Pecan tree is enough to show its relationship to our common Hickories. The compound leaves with 9 to 17 slender, long-pointed and slightly sickle-shaped leaflets are distinctive. The pollen-bearing flowers are arranged in slender, drooping tassels, which occur in threes on a single stalk, as do those of the other Hickories. Those of the Pecan are more slender than those of other species.

The most striking distinguishing characteristic of the Pecan is its fruit. It occurs in compact clusters of 3 to 11 nuts, each nut with a thin husk, which is more or less winged along the sutures. The kernel of the nuts is large and sweet.

Many different horticultural varieties of Pecan have been developed, and it seems fair to predict that the Pecan orchard business will continue to extend itself, for there is a ready market for all the nuts produced.



PIGNUT HICKORY

1 = Branch with immature leaves and flowers; 2 = branch with mature leaves and fruit with husk partly removed; 3 = a nut with husk removed; 4 = cross-section of a nut; 7 = a leaf-scar with bundle-scars, enlarged

PIGNUT HICKORY

CARYA GLABRA (*Miller*) *Spach*

FAMILY.—Walnut.

OTHER NAMES.—Broom Hickory; Bitter-nut Hickory.

GENERAL DESCRIPTION.—*Shape:* slender, clean and long-trunked, with narrow, oblong crown. *Height:* 50 to 60, sometimes 90 feet, with a diameter of 4 feet. *Bark:* close, dark green, shallowly furrowed, rarely peels off in plates. *Buds:* alternate, more than 2-ranked, reddish-brown to gray, oval and blunt-pointed. *Leaves:* alternate, 8 to 12 inches long, compound, with 5 to 7 leaflets. *Flowers:* appear about May, when leaves are half developed; pollen-bearing, occur in drooping tassels from 3 to 5 inches long, and clustered in threes on a common stalk; fruit-producing, occur in 2 to 5 flowered spikes. *Fruit:* variable in shape and size; pear-shaped or spherical; reddish-brown nut 1 to 2 inches long and covered by a husk which may remain closed or split open from the apex toward the middle.

PREFERRED HABITAT.—Dry ridges and hillsides; rare in swampy situations; frequently found with Chestnut and the Oaks.

RANGE.—Maine and Ontario to Manitoba and Nebraska, and south to Florida and Texas.

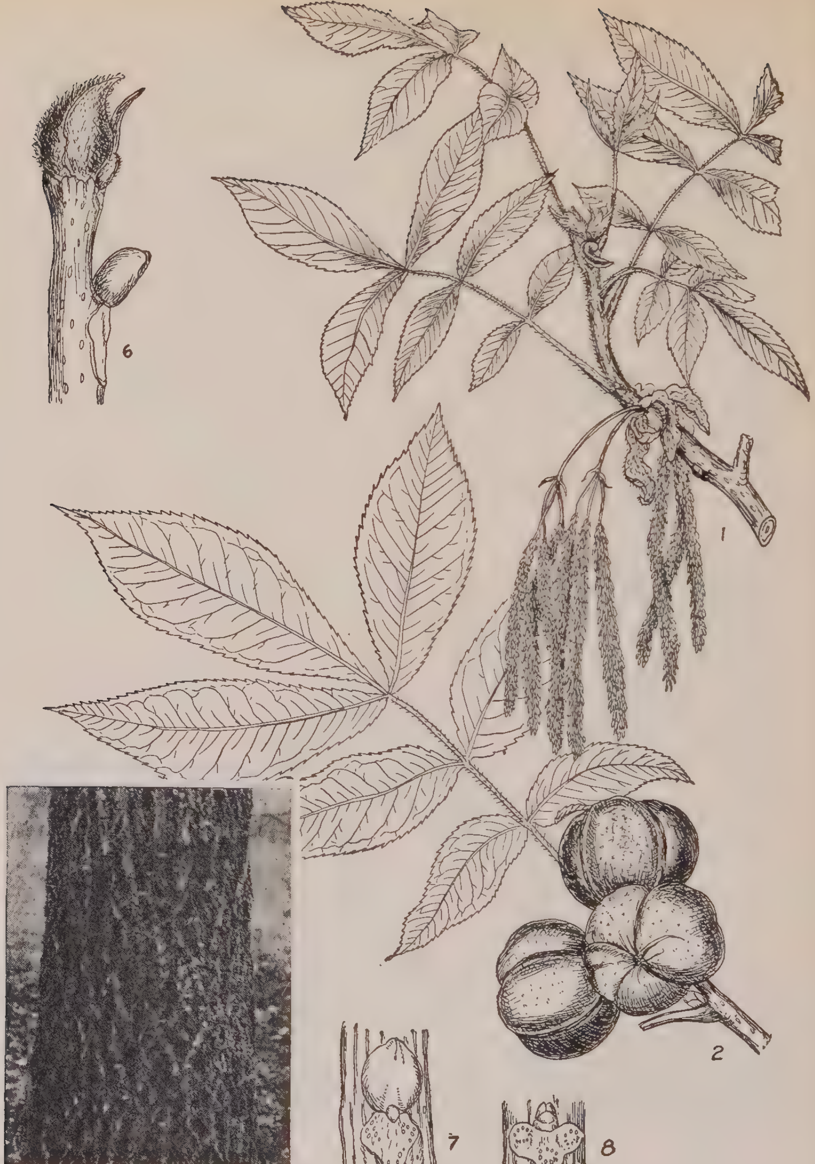
THE Pignut Hickory, unlike most of the Hickories, is a tree of the uplands, rather than the lowlands. Like so many other heavy-seeded hardwood trees, it reaches its largest size in the Ohio Valley, where exceptional specimens measure 120 feet in height.

The Pignut Hickory is most easily distinguished in winter by its smooth and rather slender twigs, and its small, oval, reddish-brown buds covered with scales, the outer pair of which is smooth and glandular dotted. The outer bud-scales fall off before spring, thus exposing the inner velvety scales. Its buds are not yellow like those of the Bitter-nut Hickory, and are smaller than those of the other Hickories associated with it.

In autumn it can be distinguished by the pear-shaped to ovoid fruit, the husk of which does not split to the base. The nut is usually small, more or less four-angled toward the tip, and contains a small and rather bitter kernel.

In summer the compound leaves with smooth leaf-stalks and 5 to 7 small leaflets are distinctive. At all seasons of the year the dark-gray, close-fitting, non-scaly, and shallowly-furrowed bark is helpful in recognizing it.

The Pignut Hickory is a valuable forest tree. It produces high-grade wood, which is becoming very scarce. Special efforts should be put forth to protect and propagate this tree.



WHITE HICKORY

WHITE HICKORY

CARYA ALBA *(Linnæus) K. Koch*

FAMILY.—Walnut.

OTHER NAMES.—Mocker-nut Hickory; Bull Nut Hickory; Big Bud Hickory; White-heart Hickory.

GENERAL DESCRIPTION.—*Shape:* trunk straight and clean, bearing a broad, round-topped crown. *Height:* 50 to 75, sometimes 90 feet, with a diameter of 3 feet. *Bark:* light to dark gray, close fitting, not shaggy, roughened by irregular furrows. *Buds:* alternate, more than 2-ranked; terminal bud large, egg-shaped, 2/5 to 4/5 of an inch long, very hairy and blunt-pointed; lateral buds smaller than the terminal, reddish-brown, and stand out from twig. *Leaves:* alternate, 8 to 12 inches long, compound with usually 5 to 7 leaflets. *Flowers:* appear about May, when leaves are half developed; pollen-bearing, borne in slender tassels 4 to 5 inches long and arranged in clusters of 3; fruit-producing, borne in 2 to 5 flowered, pale, hairy spikes. *Fruit:* a round, 4-ridged brownish nut covered with a thick hard husk, which splits to the middle or base.

PREFERRED HABITAT.—Rich, moist woods; requires considerable moisture and sunlight; occurs chiefly in valleys and in fertile situations at bottom of mountain slopes.

RANGE.—Ontario and Massachusetts to Nebraska, and south to Florida and Texas.

AT least three of the many common names given to this tree are appropriate. It is called White Hickory because a large proportion of its wood is white sapwood. Some wood workers think its wood is better than that of other Hickories because of the larger amount of white sapwood which it yields. The name Big Bud Hickory is applied to it because the terminal buds are truly big, being larger than those of any other Hickory. "The name Mocker-nut stands for (New York) Dutch *mokernoot*, 'heavy-hammer nut,' *i. e.* one which, owing to the thickness of its shell, it takes more than a light hammer to crack it." (W. R. Gerard.) The outward appearance of the nuts is similar to that of the Shell-bark, but the kernel is hardly equal to that of the Pignut Hickory.

The best way to distinguish the White Hickory in summer is by its leaves with 5 to 7 leaflets and hairy leaf-stalks. The leaflets are strongly aromatic if crushed. The twigs are usually downy to hairy, a characteristic which is helpful in recognizing it at all seasons of the year. The bark is close-fitting and furrowed, and does not shag off in plates like that of the Shag-bark Hickory. The nuts vary greatly in size, but are usually large, resembling those of the Shag-bark Hickory. The husk of the fruit is thick and 4-valved, and surrounds a globular brownish nut with a small but sweet and edible kernel. The White Hickory is an important timber tree, thriving best in rich, moist woods.

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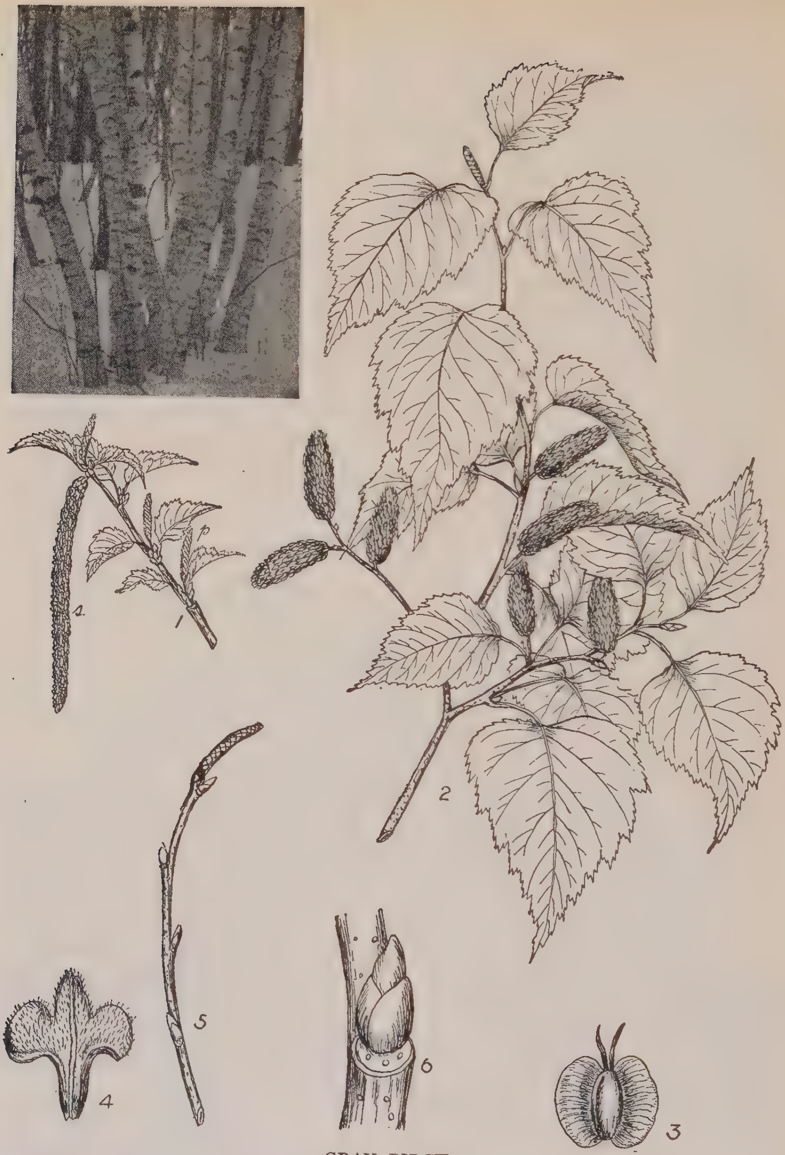
1 = Branch with immature leaves and flowers; 2 = branch with mature leaf and fruit; 6 = a winter branchlet, slightly enlarged; 7 = section of winter branch, enlarged; 8 = section of winter branch, enlarged



GRAY BIRCH

1 = Flowering branch with immature leaves, (s) staminate flowers, (p) pistillate flowers; 2 = branch with mature leaves and fruiting strobiles; 3 = a winged seed, enlarged; 4 = a strobile scale, enlarged; 5 = a winter branch with a partly developed terminal staminate ament; 6 = section of a winter twig, enlarged

THE BIRCH FAMILY

BETULACEÆ

THE Birch Family comprises six different groups of trees and shrubs which are confined to the colder part of the northern hemisphere. All the members, even though they are separated into different groups, have some features in common. The following five groups have representatives in the United States:

Common Name	Scientific Name
1. Hazelnuts.	Corylus.
2. Hop Hornbeams.	Ostrya.
3. Hornbeams.	Carpinus.
4. Alders.	Alnus.
5. Birches.	Betula.

About thirty-five different species of Birches are known in the world. Most of them attain tree size, but a few remain shrubs. Among the fifteen species native to North America are the Paper Birch, River Birch, Black Birch, Yellow Birch, and Gray Birch.

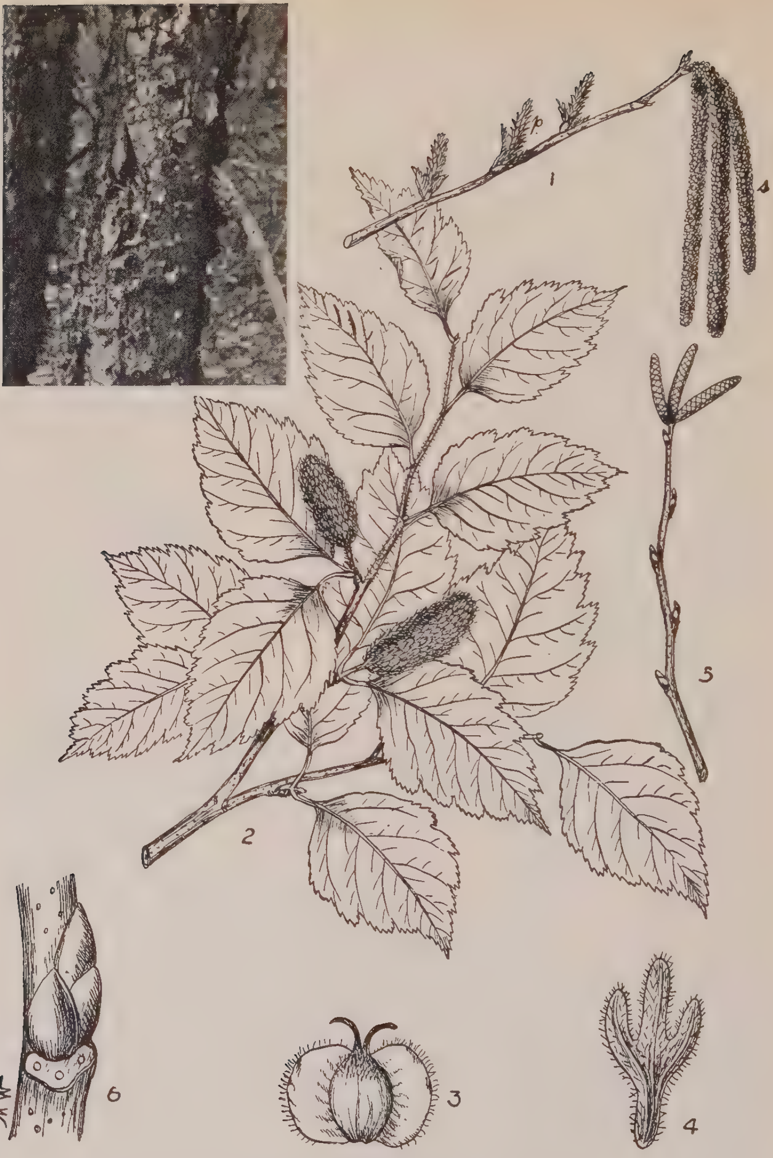
GRAY BIRCH

BETULA POPULIFOLIA *Marshall*

FAMILY.—Birch.

OTHER NAMES.—White Birch; Oldfield Birch; Poverty Birch; Poplar Birch.

GENERAL DESCRIPTION.—*Shape:* narrow, pyramidal, and pointed. *Height:* 20 to 30, sometimes 45 feet. *Bark:* dull white, smooth, close-fitting, marked with black triangular blotches. *Buds:* egg-shaped, about 1/5 of an inch long, sharp-pointed, covered with 3 to 4 visible smooth brown scales. *Leaves:* alternate, simple, 2 to 3 inches long, triangular to egg-shaped, long-pointed at apex, slender-stalked. *Flowers:* appear about April; pollen-bearing and seed-bearing occur separately, but on same tree; the former occur in drooping tassels, and the latter in cylindrical spikes. *Fruit:* a slender, cylindrical cone containing numerous small winged seeds and 3-lobed bracts.



RED BIRCH

1 = Flowering branch with (s) staminate flowers, (p) pistillate flowers; 2 = branch with mature leaves and two fruiting strobiles; 3 = a winged seed, enlarged; 4 = a strobile scale, enlarged; 5 = a winter branch with three partly developed terminal staminate aments; 6 = section of a winter branch, enlarged

Preferred Habitat.—Moist soil along streams, ponds, and lakes, but grows also on dry, rocky situations.

Range.—Nova Scotia to Lake Ontario, south to Delaware and southern Pennsylvania.

Trees with a white bark are always conspicuous. The Gray Birch has a white bark which is covered with triangular black spots located at the origin of lateral branches.

There are two distinct kinds of Birch trees with white bark native to the northeastern part of North America. The one is known as Paper Birch or Canoe Birch. The other white-barked Birch is known usually by the common names Gray Birch or White Birch. It rarely exceeds thirty-five feet in height, and its bark is close-fitting, and does not peel off readily in thin layers.

You will find no tree in the forest with a leaf like that of the Gray Birch. It is triangular in outline, tapering gradually and gracefully from a broad base to a fine long point, and the leaf margin is sharply toothed. The long slender leaf-stalks allow the leaves to be fluttered by every breeze, until the whole tree is one mass of glimmering green. The tree was happily named by Marshall *Betula populifolia*, meaning a birch with poplar-like leaves, for their trembling habit is truly characteristic of the Poplars or Aspens.

No more adaptive tree is known. It thrives along the banks of lakes and streams, and withstands the rigors and deficiencies of a dry and rugged mountain top. Its form is also easily modified by methods of treatment.

Red Birch

Betula nigra *Linnæus*

Family.—Birch.

Other Names.—River Birch; Water Birch.

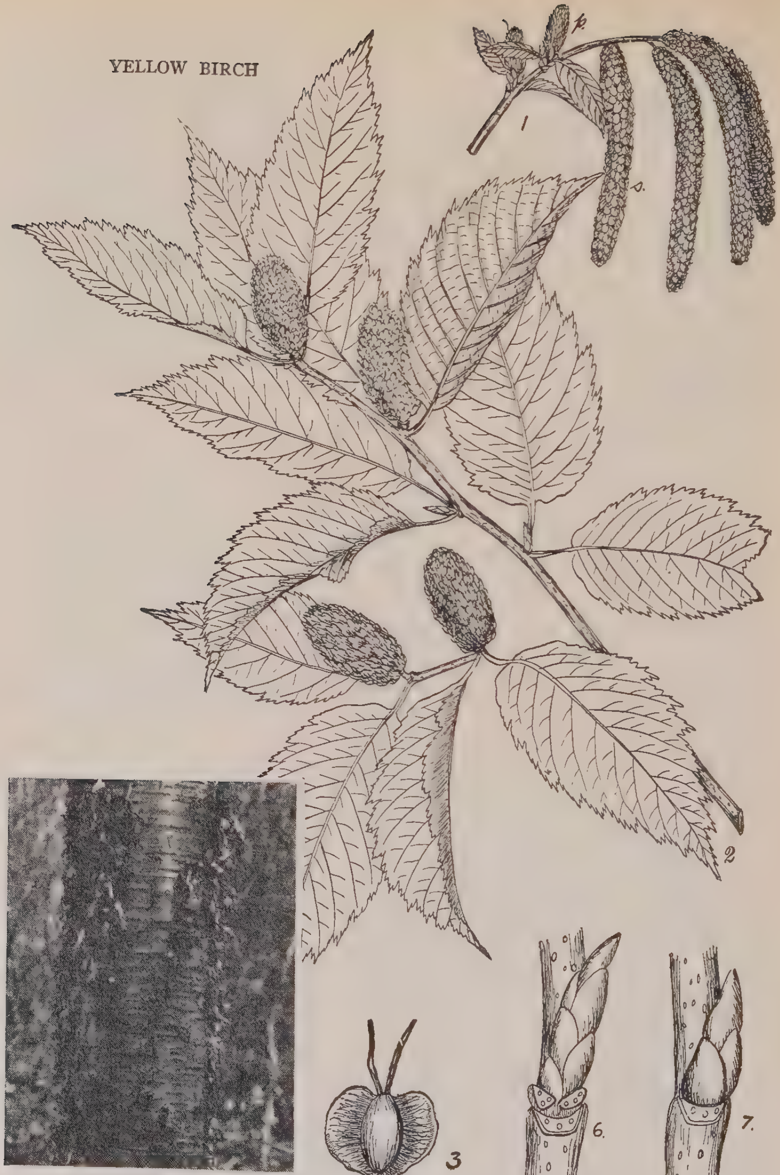
General Description.—*Shape:* short and divided trunk, bearing rather narrow oblong and irregular crown. *Height:* 30 to 50, sometimes 100 feet, with a diameter of 5 feet. *Bark:* on old trunks dark reddish-brown and rough; on young trunks peels off in thin, film-like reddish-brown to greenish-brown papery scales. *Buds:* alternate, egg-shaped, sharp-pointed, smooth or slightly hairy. *Leaves:* alternate, small, egg-shaped, 1½ to 3 inches long, doubly serrate on margin and deep green on upper surface. *Flowers:* appear about April; pollen-bearing, arranged in drooping tassels 2 to 3 inches long; seed-producing, occur in stubby spikes about 1/3 of an inch long. *Fruit:* an erect cylindrical spike (strobile), 1 to 1½ inch long.

Preferred Habitat.—Banks of streams, lakes, pools, and swamps.

Range.—Massachusetts to Florida, west to Minnesota, Kansas, and Texas.

This tree has a number of appropriate common names. It is called Red Birch because the bark on young stems and larger branches is reddish-brown to cinnamon-red in color. It peels off in thin film-like layers. If

YELLOW BIRCH



1 = Flowering branch with (s) staminate flowers, and (p) pistillate flowers; 2 = branch with mature leaves and four fruiting strobiles; 3 = a winged seed, enlarged; 6 = section of a lateral winter twig, enlarged; 7 = section of a terminal winter twig, enlarged

one recognizes the tree only once, it is seldom forgotten. River Birch and Water Birch are also appropriate names, for of all the trees that frequent river banks, swamps, and other wet places, this is perhaps the most constant.

The Red Birch is readily recognized in summer by the hairiness of its small twigs and the broadly wedge-shaped base of its leaves. It matures its fruit in early summer before any of the other native Birches.

The Red Birch is essentially a southern tree, for it reaches its largest size in the South where no other species of Birch is found. It extends northward along the principal streams, and sometimes reaches a fair size in the northern part of its range. A tree standing along the west branch of the Susquehanna River in northern Pennsylvania has a diameter of almost 4 feet.

The Red Birch is a valuable tree in landscape work. It is useful and ornamental along streams, grows rapidly, is easily transplanted, and has few insect enemies.

YELLOW BIRCH

BETULA LUTEA *Michaux*

FAMILY.—Birch.

OTHER NAMES.—Silver Birch; Gray Birch.

GENERAL DESCRIPTION.—*Shape:* large tree with straight trunk, bearing open hemispheric crown. *Height:* 60 to 80, sometimes 100 feet, with a diameter of 4 feet. *Bark:* on old trunks rough and furrowed; on young trunks peels off in yellow, thin, film-like papery scales. *Buds:* alternate, about ¼ of an inch long, sharp-pointed, smooth, covered with reddish-brown scales. *Leaves:* alternate, simple, occur singly or in pairs but never opposite, 3 to 4 inches long, egg-shaped, and doubly serrate on margin. *Flowers:* appear about April before the leaves; pollen-bearing, occur in drooping tassels, about 3 inches long; seed-producing, occur in stubby spikes, light, red, hairy, about 2/3 of an inch long. *Fruit:* an erect, short-stalked spike (strobile) from 1 to 1½ inch long.

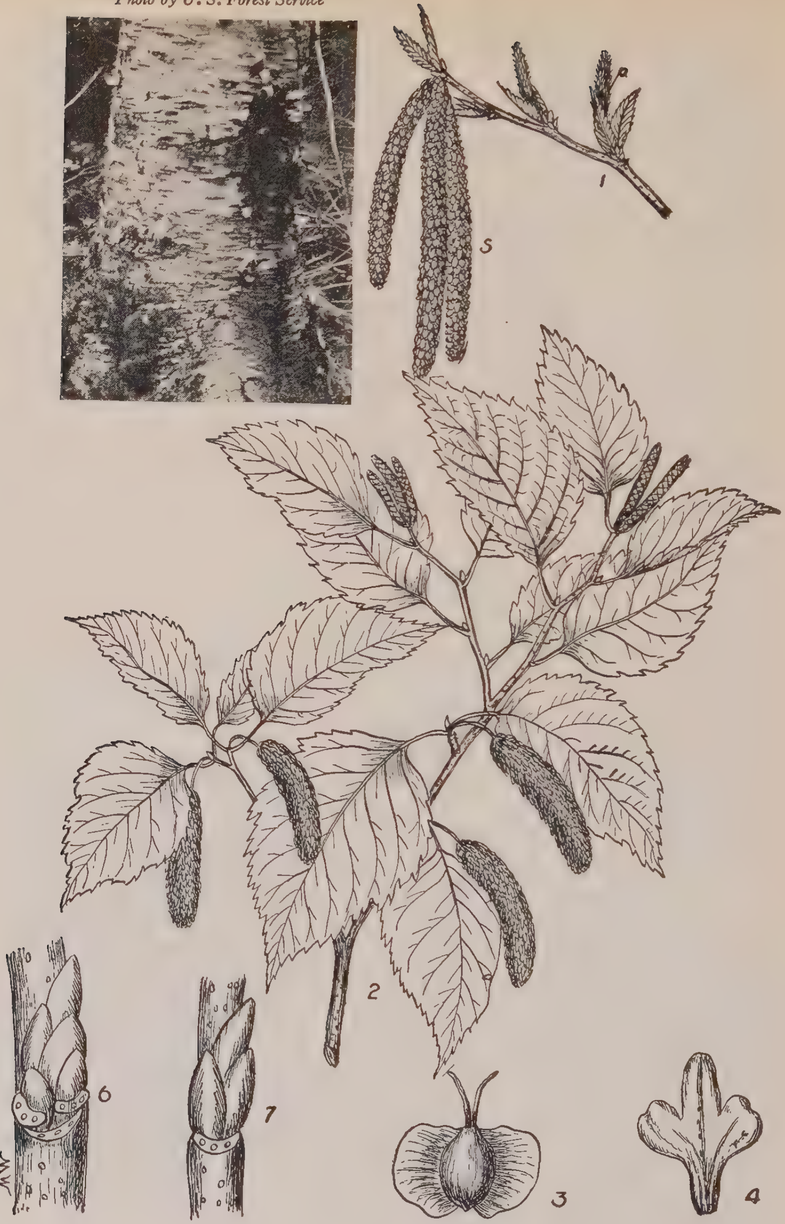
PREFERRED HABITAT.—Moist, rich uplands, borders of streams and in swamps.

RANGE.—Newfoundland to Minnesota, south to Pennsylvania, and along the mountains to North Carolina and Tennessee.

THE Yellow Birch is easily recognized wherever it grows by the ragged yellow bark which peels off in thin, film-like, papery scales. Its method of peeling the bark resembles that of the Paper Birch and Red Birch, but it does not have the white color of the former nor the reddish to greenish-brown color of the latter. The loose, film-like papery scales of the Red Birch are thicker and smaller than those of the Yellow Birch.

The twigs of the Yellow Birch resemble those of the Black or Sweet Birch and they have the sweet wintergreen flavor of the latter. The bark on the trunks of the closely associated Black Birch is close-fitting, blackish, cherry-like, and does not peel off in thin layers. The scales

Photo by U. S. Forest Service



CANOE BIRCH

of the fruit of Black Birch are smooth and about equally lobed, while those of the Yellow Birch are hairy and unequally lobed. The Yellow Birch is commonest upon wet situations, while the Black Birch frequents dry and rocky places.

The Yellow Birch is one of the important timber trees of the Northeastern United States. It is propagated easily, has few insect or fungous enemies, and produces valuable wood used extensively in the manufacture of furniture, flooring, boxes, veneer, fuel, pulp, and chemicals.

CANOE BIRCH

BETULA ALBA var. PAPYRIFERA (*Marshall*) *Spach*

FAMILY.—Birch.

OTHER NAMES.—Paper Birch; White Birch; Gray Birch; Golden Birch.

GENERAL DESCRIPTION.—*Shape:* short-trunked, bearing a narrow, open crown. *Height:* 50 to 75, sometimes 80 feet, with a diameter of 3 feet. *Bark:* chalky to creamy white, tinged with yellow, and peeling off in thin, film-like layers. *Buds:* alternate, egg-shaped, sharp-pointed, dark chestnut-brown, about ¼ of an inch long. *Leaves:* alternate, simple, oval, 2 to 3 inches long, and finely toothed on margin. *Flowers:* appear about April before the leaves; pollen-bearing, arranged in drooping tassels, 3 to 4 inches long; seed-producing; occur in bright red, erect clusters about 1 inch long. *Fruit:* a short-stalked, cylindrical spike, about 1½ inch long.

PREFERRED HABITAT.—Rich wooded slopes, borders of lakes, swamps, and streams; frequently mixed with other hardwood trees and occasionally with evergreens.

RANGE.—Newfoundland to Alaska, south to Pennsylvania, Michigan, Colorado, and Washington.

THE Canoe Birch, also known as Paper Birch and White Birch, is a northern tree. It extends south only as far as northern Pennsylvania, but reaches across the entire continent from Newfoundland to Alaska.

It is very abundant in the great forest region of Canada and the northern United States, where it frequents the banks of lakes and rivers and is regarded as one of our most beautiful and characteristic trees.

The Canoe Birch is one of the best-known trees in its range. Every school-child knows that the bark of this tree was used in the building of canoes by the Indians and early settlers, and everyone who has had the privilege to roam through the Northwoods will forever remember its chalky to creamy white bark that peels off in thin film-like layers.

In addition to its white and loosely-peeling bark, this Birch may be recognized by its broadly oval leaves with short, stout leaf-stalks, which

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1 = Flowering branch with immature leaves, (s) staminate flowers, (p) pistillate flowers; 2 = branch with mature leaves, fruiting strobiles, and partly developed staminate aments; 3 = a winged seed, enlarged; 4 = a strobile scale, enlarged; 5 = a winter branch with three partly developed terminal staminate aments; 6 = section of a lateral winter spur-branch, enlarged; 7 = section of a terminal winter branch, enlarged

are smooth or covered with only a few hairs. The fruiting spikes are short-stalked, cylindrical, and usually droop, while those of the other Birches generally stand erect. The Canoe Birch is not so abundant in specimens as the Gray Birch, but it reaches a larger size, produces better wood, and becomes far more attractive.

THE BEECH FAMILY

FAGACEÆ

ALTHOUGH the Beeches, Chestnuts, and Oaks represent three different groups of trees, they all belong to the Beech Family, which contains some of the most important timber trees of North America, and has representatives in nearly all parts of the world. They yield not only high grade wood, but also supply large quantities of cork, and tanning and dyeing materials, and furnish much food for birds and other animals.

About 600 species of trees and shrubs are found in the world which belong to the Beech Family, of which number sixty are native to North America, and are usually grouped in the following five classes:

Common Name	Scientific Name
1. The Beeches.	Fagus.
2. The Chestnuts.	Castanea.
3. The Oaks.	Quercus.
4. The Tanbark Oaks.	Pasania.
5. The Western Chinquapins.	Castanopsis.

THE BEECHES

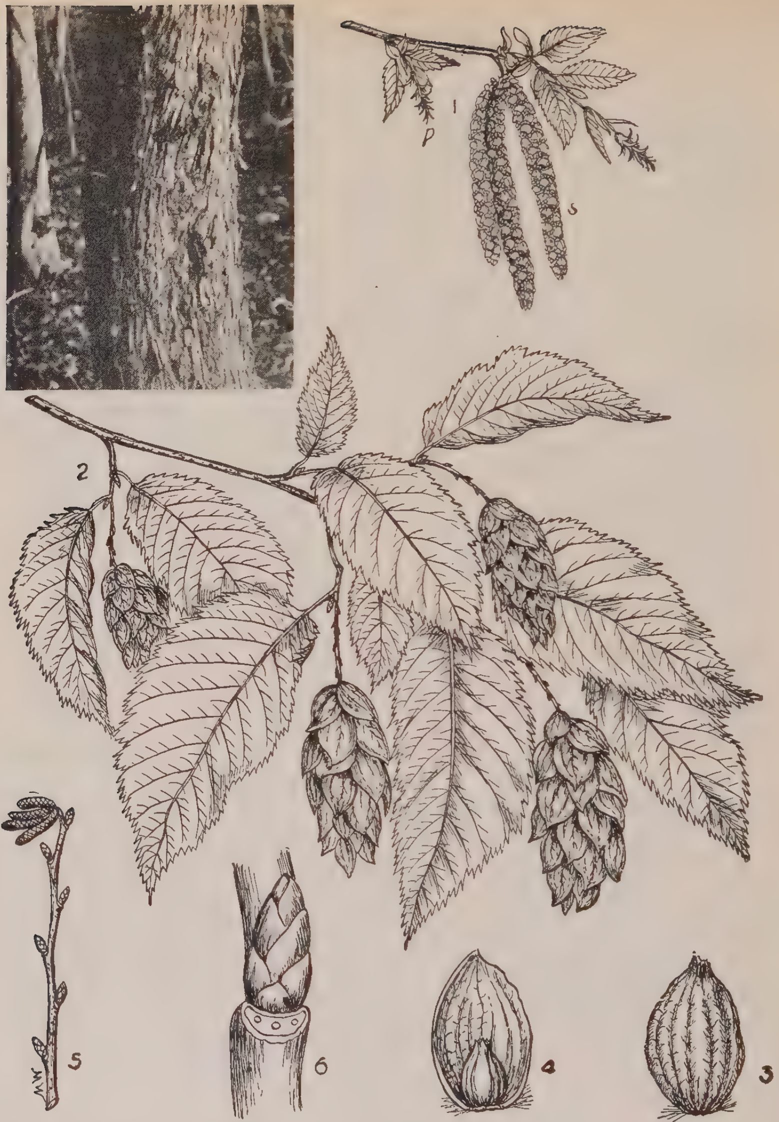
Fagus

There are in all five species of Beech in the world, three of which are native to Asia, one to Europe, and one to America. Their distribution is limited to the northern hemisphere, whence they form some of the most attractive natural and cultural forests known to man.

The European Beech (Fagus sylvatica) is one of the most important forest trees of continental Europe. Pure stands of this tree are common in Belgium, Denmark, Germany, and northern France, where thousands of acres were destroyed during the recent war by the contending armies. A number of ornamental varieties of this species have been developed and extensively introduced into the United States, viz.: the Weeping Beech, Purple Beech, and Cut-leaf Beech so common in our gardens, lawns, and parks. This species with its many varieties figured greatly in ancient literature, and now plays an important rôle in scientific forestry of Continental Europe.

The Beeches as a group are elegantly groomed in winter and beautifully clad in summer. The nuts produced by them furnish a nutritious article of food, which was extensively used by man for food in ancient times and during the World War. Formerly an oil was extracted from the nuts and widely used in lamps and for cooking. The leaves when green furnish forage for cattle, and when dry are used to fill mattresses and for stable litter.

Beech wood is extremely valuable as lumber and unsurpassed as a fuel-wood, especially when used in fireplaces. In Continental Europe it is prized so highly that the peasants gladly and zealously collect the twigs and small branches and convey them to their homes where they are used as fuel. Such an intensive and complete utilization of all parts of the tree, in part accounts for their attractive and clean forests, which stand in strong contrast with some of our American debris-laden and unclean forest areas.



IRON-WOOD

1 = Flowering branch with immature leaves, (s) staminate flowers, (p) pistillate flowers; 2 = branch with mature leaves and hop-like fruit clusters; 3 = a seed with inclosing membrane removed, slightly enlarged; 4 = a seed with part of inclosing membrance removed, slightly enlarged; 5 = a winter branch with partly developed terminal staminate aments; 6 = section of winter twig, enlarged

IRON-WOOD

OSTRYA VIRGINIANA (*Miller*) *K. Koch*

FAMILY.—Birch.

OTHER NAMES.—Hop Hornbeam; Leverwood; Deerwood.

GENERAL DESCRIPTION.—*Shape:* very broad and wide-spreading crown, with drooping branches. *Height:* 20 to 30, sometimes 60 feet, with a diameter of 1½ foot. *Bark:* alternate, slightly hairy, egg-shaped, sharp-pointed, about ¼ of an inch long. *Leaves:* alternate, simple, egg-shaped, 3 to 5 inches long, finely serrate on margin, and dull yellowish-green on upper surface. *Flowers:* appear about April with the leaves; pollen-bearing, arranged in drooping tassels about 2 inches long; fruit-producing, appear in erect spikes, each one inclosed in a hairy, bladder-like bract. *Fruit:* a small, flat nutlet, inclosed in an inflated bladder-like bract.

PREFERRED HABITAT.—Dry, gravelly slopes and ridges.

RANGE.—Cape Breton Island to Florida, west to Minnesota and Texas.

THE Iron-wood is distributed widely over the eastern United States but is not abundant in any part of its range. It usually occurs solitary and is commonly found in the understory of the forest.

It can readily be recognized by its thin, grayish-brown bark, which peels off into narrow, flat scales, which are often loose at both ends and attached only in the middle. The hop-like grouping of the fruit, which appear like a cluster of little sacks, is very distinctive. The fruit sacks usually drop to the ground before winter, but the stalks to which they are attached often hang on for a while.

Few trees have such fine interlacing branches, that are displayed so clearly in winter. Another winter characteristic is the pollen-bearing catkins, which are about ½ an inch long and usually occur in threes at the end of the twigs. The small 2-ranked leaf-scars with 3 bundle-scars and the small reddish-brown buds with 4-ranked scales are also helpful distinguishing features in winter.

It would be difficult to find leaves of more beautiful texture than those of the Iron-wood. Their autumnal color is distinctly yellow, while those of the closely-related American Hornbeam are orange to deep scarlet.

The wood is heavy, hard, strong, and durable. It is about 30 per cent. stronger than White Oak, and is used for fence-posts, tool-handles, and mallets.

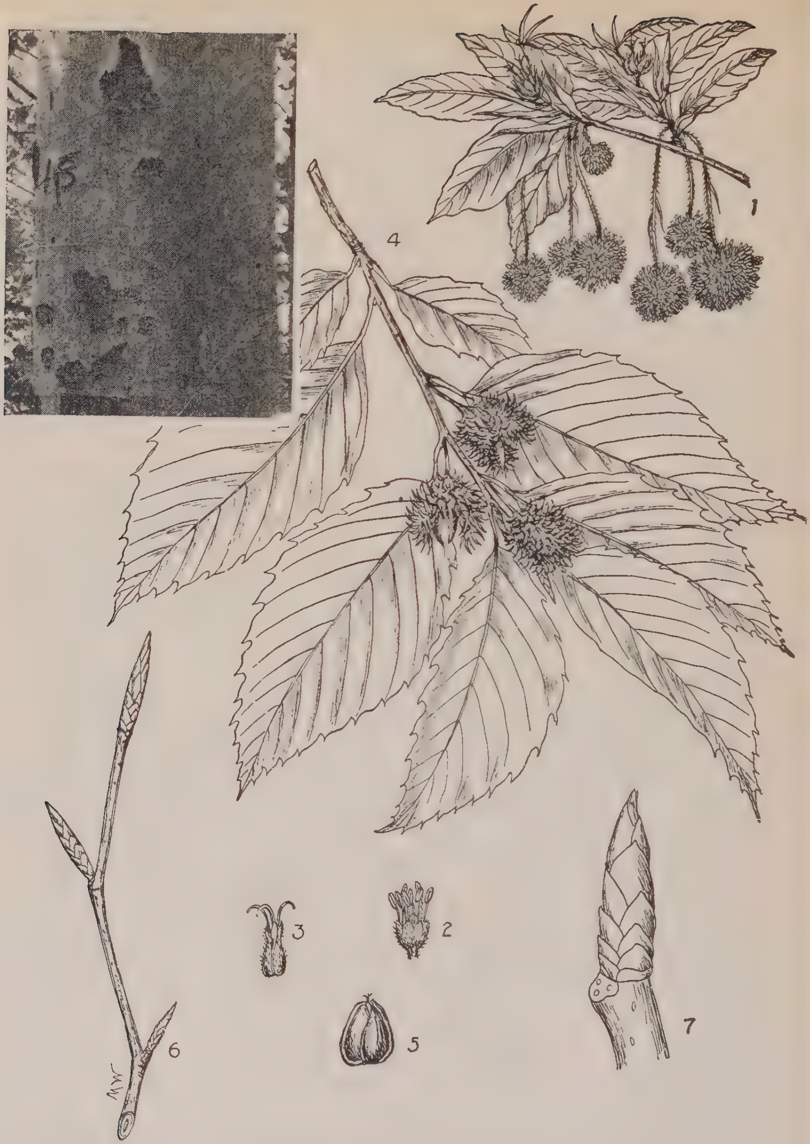
BEECH

FAGUS GRANDIFOLIA *Ehrhart*

FAMILY.—Beech.

OTHER NAMES.—American Beech; Red Beech; White Beech.

GENERAL DESCRIPTION.—*Shape:* in open places crown is dense, high, conical, and symmetrical; in dense stands trunk is long and clean, and crown shallow and narrow. *Height:* usually 50 to 80 feet, sometimes 125 feet. *Bark:* tight-fitting, smooth, light gray,



BEECH

1 = Branch with staminate and pistillate flowers and immature leaves; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = a branch with mature leaves and three fruits; 5 = a seed, natural size; 6 = a winter branch with long, slender, and sharp-pointed buds; 7 = terminal section of a winter branch with long, slender, and sharp-pointed buds, covered with many overlapping scales, slightly enlarged mottled with dark spots. *Buds:* five times as long as wide, slender, conical, sharp-pointed, covered by 10 to 20 reddish-brown scales. *Leaves:* alternate, simple, 3 to 4 inches long, stiff, straight-veined, with pointed apex and sharp-toothed margin. *Flowers:* appear in April and May; pollen-bearing occur in stalked ball-like heads one inch in diameter; pistillate (female) occur in two-flowered clusters in leaf axils. *Fruit:* a stalked, prickly, four-valved bur, containing triangular brown nuts, maturing in September and October.

PREFERRED HABITAT.—Common on rich, moist bottomlands, also thrives in rich, gravelly and moist uplands. Endures dense shade.

RANGE.—Nova Scotia to Ontario and Wisconsin, south to Florida and Texas.

THERE is only one Beech native to America. Its features are so striking and so different from other trees that it may be recognized very easily, and when once known will not be forgotten. One distinctive characteristic is present throughout the entire year and may be relied upon under all conditions of growth, namely, the quaker-gray, close-fitting, and smooth bark, upon which the American youth has been cutting his initials and other outline carvings.

It is, however, not necessary to rely on a single distinguishing characteristic, for even in the midst of winter other striking features are at hand. The slender, sharp-pointed, conical winter-buds, three-quarters to one inch long and covered with ten to twenty reddish-brown scales, cannot be confused with those of any other native tree.

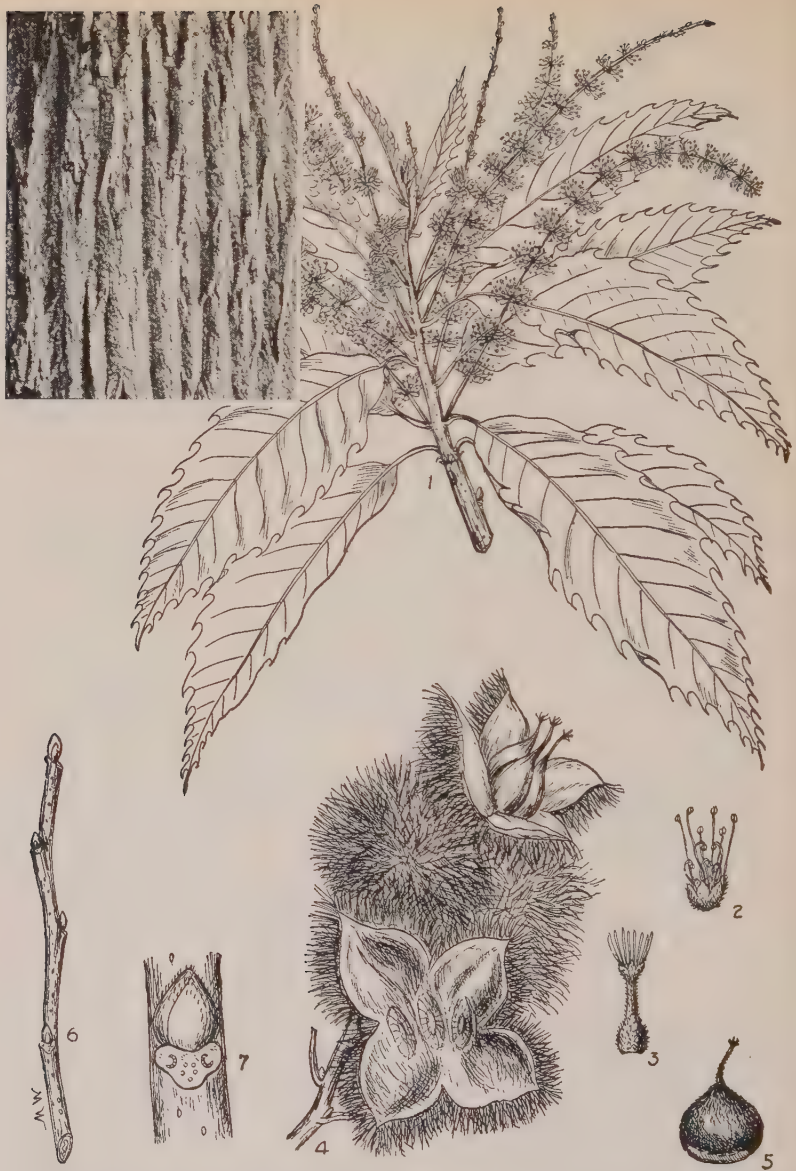
The ovate and stiff leaves with straight veins and coarsely serrate margins are also distinctive. The wood produced by the Beech is by no means the best upon the market, but it is probably employed more extensively in the manufacture of different articles used in the household than any other wood.

From early to late autumn the Beech, next to the Chestnut, is the most frequented of all the native trees. It produces an edible nut prized by man, and by squirrels, blue-jays, and many other domestic and wild animals.

THE CHESTNUTS

CASTANEA

There are five different species of Chestnut in the world, four of which reach tree-size and one remains a shrub. They occur only in the northern hemisphere, where they are widely distributed in eastern North America, southern Europe, northern Africa, western Asia, and central and northern China and Japan.



CHESTNUT

1 = Branch with staminate and pistillate flowers and mature leaves; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = a branch with a cluster of closed and open burs; 5 = a nut; 6 = a winter branch; 7 = a section of winter branch, enlarged

The Sweet Chestnut of southern Europe reaches an enormous size and attains a great age. The world-famous specimen of this species known as the "Chestnut of a Hundred Horsemen," on Mt. Ætna in Sicily, while probably an aggregate of five trees, had a circumference of 200 feet. Some other specimens of this same species reached an estimated age of 1,000 years. The natural occurrence of the Sweet Chestnut in southern Europe serves as a valuable guide to land-owners in locating vineyards, for one is safe in planting grapes only as far north and to as high an altitude as the chestnut grows, and if these limits are exceeded, frost is sure to interfere with their establishment and development.

The Chestnut Blight, which was imported from China and began its reign of conquest about 1907 in the vicinity of New York City, has already done irreparable damage to the Chestnut forests of the eastern United States.

Three species of Chestnut are native to eastern North America, two of which attain tree-size, and one (*Castane alinfolia*) seldom exceeds three feet in height, and is native to the south Atlantic States. The two species which attain tree-size are the Common Chestnut and the Chinquapin. The latter yields delicious small nuts, and in the northern part of its range in Pennsylvania seldom exceeds twenty feet in height, while it reaches a height of fifty feet in the Southern States.

CHESTNUT

CASTANEA DENTATA (*Marshall*) *Borkenhausen*

FAMILY.—Beech.

GENERAL DESCRIPTION.—*Shape:* in open places trunk is short and crown high and widespreading; in dense stands long clean trunks bear shallow and narrow crown. *Height:* sometimes 140, usually 60 to 100 feet. *Diameter:* often 4 to 5 feet, rarely over 10 feet. *Bark:* on old trunks grayish-brown, deeply furrowed; on branches and small trunks smooth, brownish, close-fitting. *Buds:* alternate, egg-shaped, ¼ of an inch long, blunt-pointed, covered by 2 or 3 chestnut brown scales. *Leaves:* alternate, simple, 6 to 8 inches long, sharp-pointed at apex, wedge-shaped at base, toothed on margin. *Flowers:* appear in June or July; pollen-bearing clustered in long drooping tassels and pistillate (female) occur in small groups along base of tassels. *Fruit:* a prickly bur containing 1 to 5 brown nuts, maturing in September or October.

Preferred Habitat.—Grows on almost any kind of soil from bottom-lands to mountain tops, but dislikes limestone and extremely wet soil.

Range.—Maine to Michigan and Arkansas, south to Delaware, and along mountains southward to Alabama and Mississippi.

The native Chestnut is one of the best known and most valuable timber trees of eastern North America. It is not difficult to distinguish at any season of the year. The ashy-gray, fibrous, and deeply furrowed bark on old trunks is very distinctive, and the smooth brownish twigs marked with scattered light dots are also helpful in identifying it.

In summer the leaves, which are about six to eight inches long, sharp-pointed, and coarsely serrate on the margin, are a ready means of identification. About the fourth of July the Chestnut bursts forth in cream-colored blossoms, and becomes the most conspicuous feature of the landscape.

The nuts which the Chestnut tree yields are by no means the least distinctive product of this tree. They are prized highly by man, and many wild animals treasure them above all other products of the forest. The nuts are inclosed in a prickly bur, which may be nature's way of protecting them until ripe.

The wood of the Chestnut is extremely durable, especially when placed in contact with the soil. It is a valuable wood for telegraph and telephone poles, railroad ties, mine props, fence posts, and fence rails.

THE OAKS

Quercus

The Oaks are world famous on account of their wide distribution, physical sturdiness, great strength, and the high commercial value of their wood, which has a wide range of uses. Most of them attain a great age, and reach a large size. The lives of some European species is believed to reach 1,000 years, while a few American specimens have been found which exceeded 500 years.

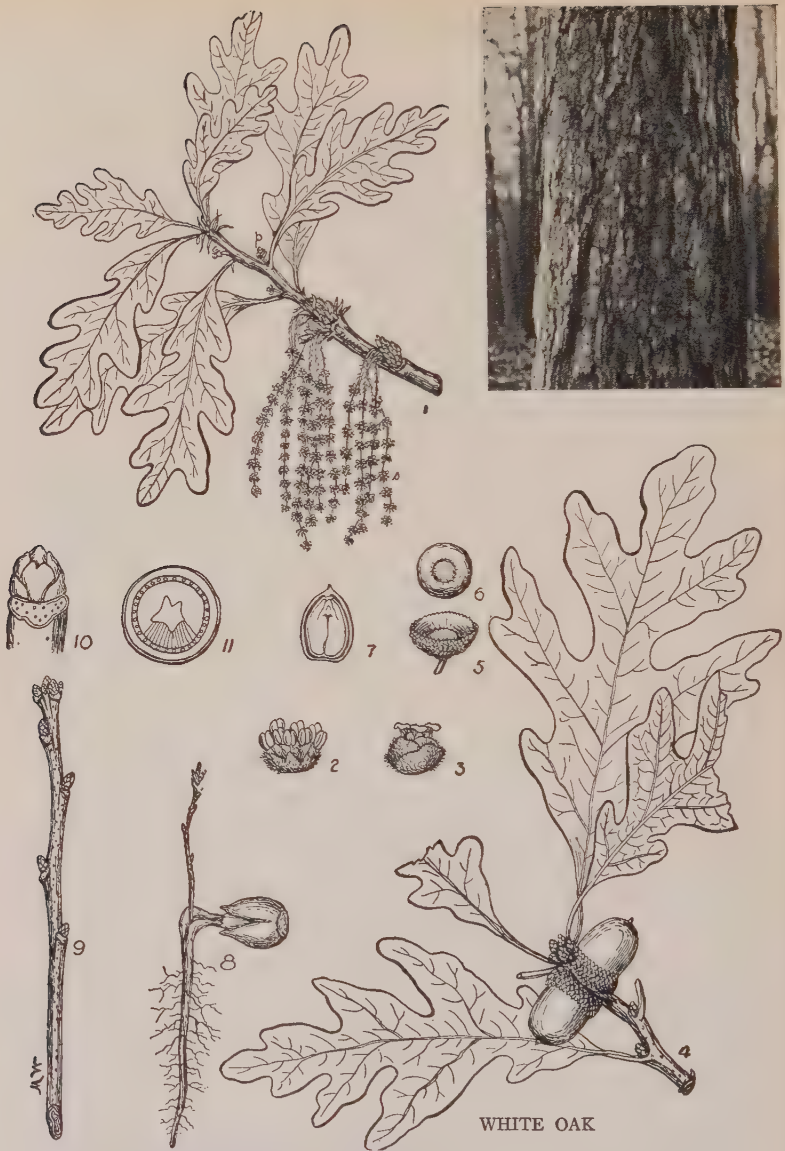
The value of the Oaks has been appreciated for many centuries. The ancients worshiped them, and Socrates regarded the Oak as the "tree of knowledge." They are closely associated with the history and literature of England, where they are famous in prose and poetry alike. The early Britons, as well as the later conquerors, comprehended their real worth and value. In America, the Charter Oak holds a prominent and lasting place in our colonial history.

Every woodsman and forester loves the American Oaks. They are attractive at all seasons of the year, whether in the first pale dress of spring tinged with delicate pink, or the deeper tones of summer; the rich purple, scarlet, or red of autumn, or the dull brown of Indian summer; perhaps they are most beautiful and picturesque in winter, when free from their foliage, and with their stout and gnarled branches standing out in picturesque outline against the sky.

The American Oaks are equally as attractive as their European brethren, and of far greater commercial value. Their wood has a wide range of uses, and the kernel of the nuts of some of them is edible. The Indians, and even the early white settlers, used the white oak acorns for food. During the World War all the seeds produced by the Oaks, Beech, and Chestnut throughout Continental Europe and Great Britain were used by man. They furnished food for the family and nourishment for domestic animals. In olden days it was an established practice to fatten hogs on fallen acorns and beech nuts. In some forests as many as 20,000 hogs were fattened in one year. The bark of a few species, particularly Rock Oak, is rich in tannin, which is used in the manufacture of tannic acid and the preparation of leather. The inner bark of the Black Oak is locally manufactured into a yellow dye employed in the preparation of various cloths, particularly khaki. Large quantities of this bark were harvested during the recent war, and helped to overcome the great shortage of domestic raw dye material felt so keenly everywhere.

Of the 300 species of Oaks which are known in the world, fifty-five species are native to North America. The latter are usually divided into three groups:

1. *White Oaks*, which mature their acorns in one year, and have leaves with rounded lobes.



WHITE OAK

1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = branch with mature leaves and mature acorns; 5 = acorn cup; 6 = acorn, basal view; 7 = longitudinal section of acorn, showing embryo; 8 = germinating acorn with its young root and shoot; 9 = winter branch; 10 = terminal section of winter branch showing bud with overlapping scales, a leaf-scar with bundle-scars, and lenticels, enlarged; 11 = cross-section of twig showing pentangular pith, wood with conspicuous medullary rays, inner and outer bark, enlarged

2. *Black Oaks*, which mature their acorns in two years, and have leaves with bristle-pointed lobes.

3. *Evergreen* or *Live Oaks*, which retain their leaves for two or three seasons, while the leaves of the other Oaks persist only for one season.

WHITE OAK

QUERCUS ALBA *Linnæus*

FAMILY.—Beech.

GENERAL DESCRIPTION.—*Shape:* tall, broad, round-topped. *Height:* sometimes 150 feet. *Age:* rarely over 500 years. *Bark:* light gray, scaly. *Pith:* star-shaped. *Buds:* alternate, reddish-brown, egg-shaped, 1/8 of an inch long. *Leaves:* alternate, simple, 5 to 9 inches long, 2 to 4 inches wide, usually seven-lobed. *Flowers:* appear in April and May; pollen-bearing are yellowish and occur in drooping tassels; pistillate (female) are reddish, and occur on short stalks on new growth. *Fruit:* an acorn maturing in one season and ripening in September and October; nut light brown, ¾ of an inch long; cup scaly and inclosing ¼ of nut.

PREFERRED HABITAT.—Tolerates many soils, but prefers rich and moist situations.

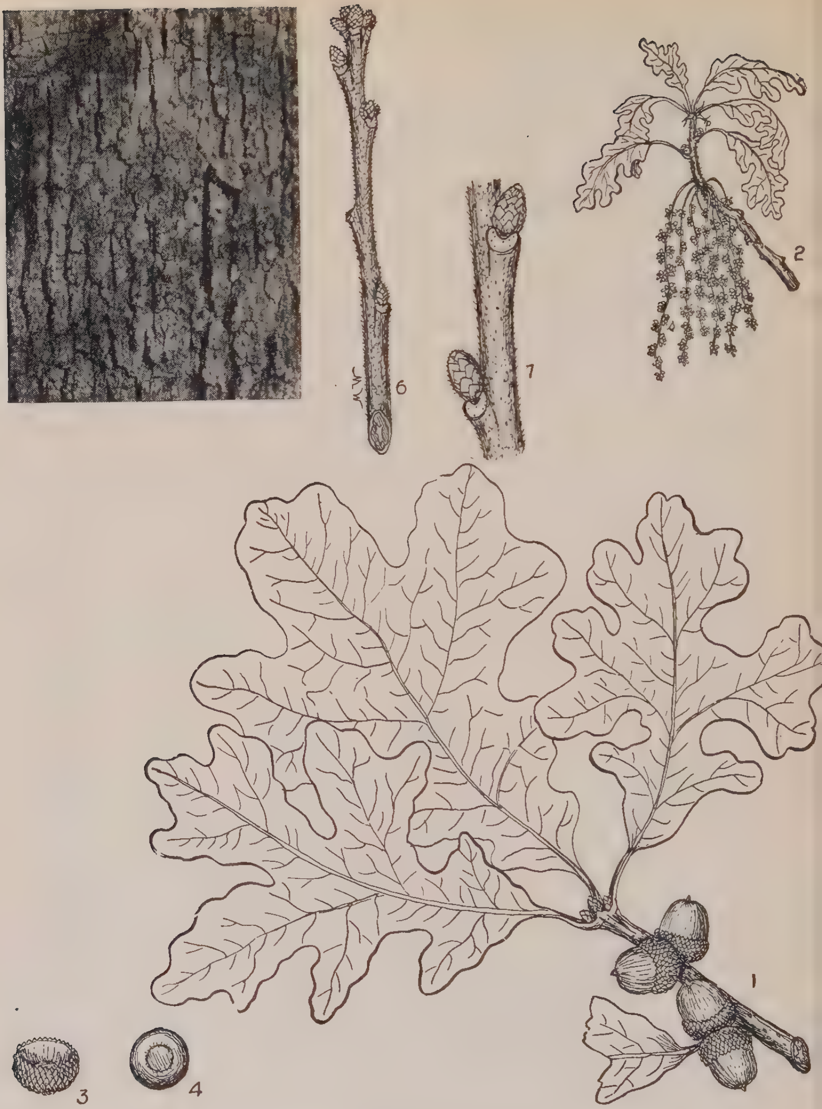
RANGE.—Maine to Minnesota, and south to Florida.

THE White Oak is the most important hardwood timber tree in eastern North America. Its wood is the most valuable of all the Oaks. It is ashy-gray in color, close-grained, hard, tough, durable, and weighs about forty-six pounds per cubic foot. No other wood has so wide a range of uses.

In summer the White Oak can be distinguished readily by its loose, scaly, grayish-white bark, and by its deeply round-lobed and obovate leaves. The leaves of all the members of the Black Oak group are bristle-tipped, and the other members of the White Oak group have leaves with shallow indentations, or differ from the true White Oak in form.

In winter this tree can be distinguished by its rather small reddish-brown and blunt-pointed buds. The Swamp White Oak has slender reddish to grayish twigs and dark loose-peeling flakes of bark on the branches; the Post Oak has greenish rusty pubescence on the twigs; and the Bur Oak has corky winged projections on the bark of the small branches, and the cups of the acorns are fringed along the margin.

The foregoing characteristics should enable even the amateur tree-student to distinguish the White Oak, so common in the forest and wood-lot, from all other trees.



POST OAK

1 = Branch with mature leaves and mature acorns; 2 = flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms; 3 = an acorn cup; 4 = an acorn, basal view; 6 = winter branch covered with a dense rusty pubescence; 7 = section of winter branch showing slightly pubescent buds, leaf-scars with bundle-scars, lenticels, and the dense rusty pubescent bark, natural size

POST OAK

QUERCUS STELLATA *Wangenheim*

FAMILY.—Beech.

OTHER NAME.—Iron Oak.

GENERAL DESCRIPTION.—*Shape:* short, stout trunk, bearing a dense, broad and round-shaped crown. *Height:* 60 to 80, sometimes 90 feet, with a diameter of 4 feet. *Bark:* resembles that of White Oak, only darker, somewhat rougher and less scaly. *Buds:* alternate, about 1/8 of an inch long, stubby, sometimes as broad as long, covered with reddish-brown hairy scales. *Leaves:* alternate, simple, 4 to 7 inches long, 3 to 5 inches wide, thick, leathery, generally 5-lobed; coated with rusty hairs on lower surface. *Flowers:* appear about May; pollen-bearing, arranged in slender drooping tassels 4 to 6 inches long. *Fruit:* an acorn maturing at the end of the first season. Nut ½ to ¾ of an inch long.

PREFERRED HABITAT.—Dry, rocky soil. Occurs also on gravelly uplands, limestone hills, and sandy plains.

RANGE.—Massachusetts, Central Pennsylvania, Kansas to Florida and Texas.

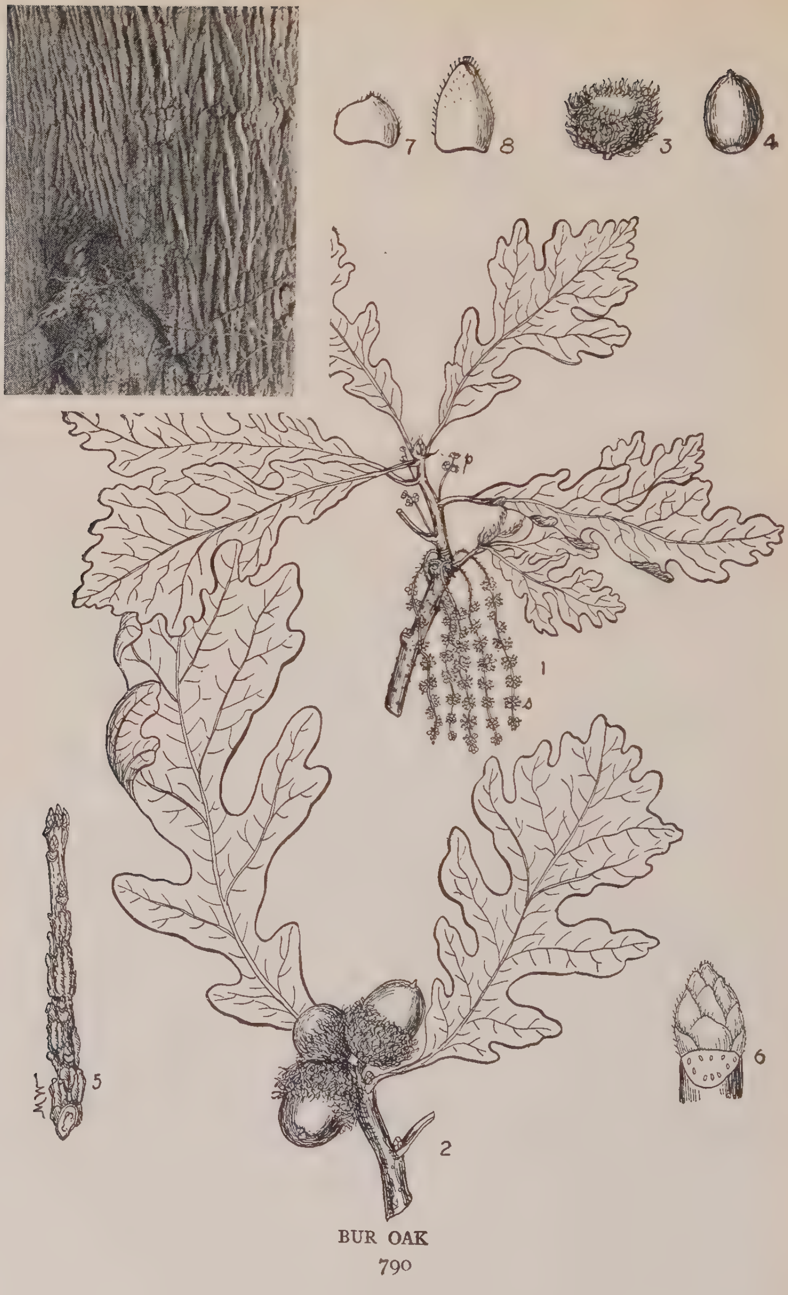
IT is easy to recognize the Post Oak in summer by the peculiar form of its leaves, which have large rounded or squarish lobes. The three terminal lobes are the largest, and the basal lobes taken together are wedge-shaped. These unusual features give the distinctive appearance to the leaves. The rigid leathery texture of the leaves, and their shiny green upper surface and rusty and hairy lower surface, are also helpful in recognizing this tree. An examination of the lower surface of the leaves with a magnifying glass shows that the hairs are star-shaped, whence the technical name, *stellata.*

In winter the Post Oak may be recognized by its short, blunt-pointed buds and its stout, rusty, and hairy twigs. The buds are about the same size as those of the White Oak, but brighter reddish in color.

In the northern part of its range it is a comparatively small tree, but in the lower Mississippi Valley, where it reaches its best development, it reaches a large size, and locally is the commonest member of the Oak forests.

The wood is firm and very hard, which may have given it the name Iron Oak. It decays slowly when placed in contact with the ground, which accounts for its extensive use for fence posts Presumably, this use gave the tree its common name—Post Oak.

The Post Oak belongs to the White Oak group, for its leaves are not bristle-tipped but are round-lobed, and its acorns mature in one season. It is a valuable forest tree in the Mississippi Valley, but has few qualities to recommend it for ornamental planting.



BUR OAK

BUR OAK

QUERCUS MACROCARPA *Michaux*

FAMILY.—Beech.

OTHER NAMES.—Over-cup Oak; Mossy-cup Oak.

GENERAL DESCRIPTION.—*Shape:* heavy and straight-trunked with broad, round-topped crown, composed of heavy spreading branches. Height: 70 to 80, sometimes 170 feet, with a diameter of 6 to 7 feet. *Bark:* on trunks ranges between flakey bark of White Oak and roughly-ridged bark of Chestnut Oak. *Buds:* alternate, about ¼ of an inch long, reddish-brown, slightly hairy. *Leaves:* alternate, simple, 6 to 12 inches long, 3 to 6 inches wide, 5 to 7 lobed; lobes separated by deep, round base clefts. *Flowers:* mature about May; pollen-bearing, arranged in slender drooping tassels, 4 to 6 inches long. *Fruit:* an acorn maturing at the end of first season; nut ¾ of an inch to 2 inches long, covered with fine hairs; acorn-cup light brown, covered with large scales which form a distinct fringe along the margin.

PREFERRED HABITAT.—Low, rich bottom-lands.

RANGE.—Nova Scotia to Manitoba, south to Pennsylvania, Kansas, and Texas.

NONE of the Oaks have more striking distinguishing characteristics than the Bur Oak. It is called Mossy-Cup Oak, for the acorn-cups are fringed along the margin to such an extent that they resemble moss. They are the most unique of all the acorn-cups. Some trees in the Mississippi Valley develop such large acorn-cups that they are called "Bird-nest Cups."

The leaves are fully as distinctive as the acorn-cups are unique. On each side and near the middle of the leaf occurs a deep, rounded cleft which reaches almost to the midrib and divides the leaves into two parts. The terminal part of the leaf has large squarish lobes and the basal part is more or less triangular.

The twigs are fully as distinctive as the acorn-cups and the leaves. They are stout, yellowish-brown, and sometimes marked with corky-winged projections standing out from the twigs from 1 to 1½ inch. This characteristic is possessed by only a few trees, such as the Cork Elm, Sweet Gum, and several other species.

The Bur Oak is one of the very largest of the American Oaks. It has a wide distribution, attains a large size, and produces valuable wood. It is a very attractive ornamental and shade tree. It is easy to transplant, grows fast, develops an excellent form, withstands smoke better than most of the Oaks, and has few insect enemies.

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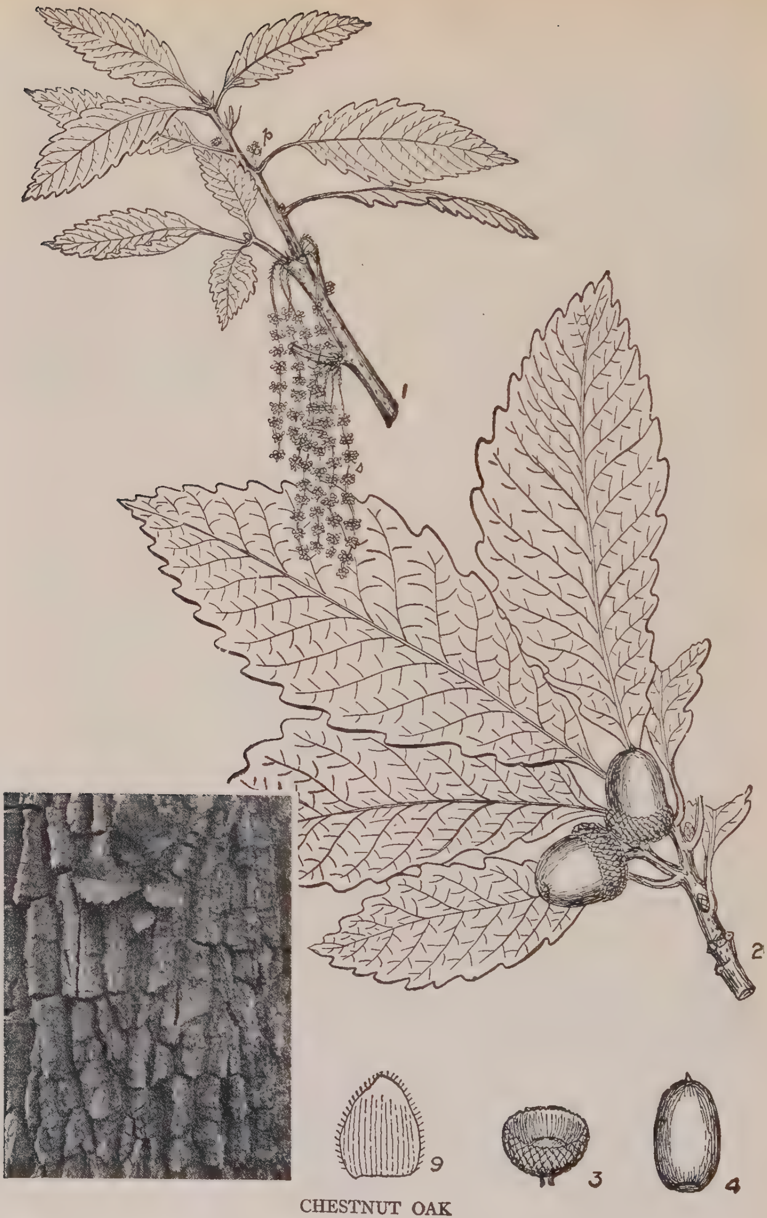
1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms; 2 = branch with mature leaves and mature acorns; 3 = an acorn cup; 4 = an acorn; 5 = a winter branch showing buds, leaf-scars, and raised corky ridges; 6 = terminal section of winter branch showing buds with overlapping scales and leaf-scar with bundle-scar, enlarged; 7 = basal bud-scale with hairy margin, enlarged; 8 = apical bud-scale with hairy serrate margin, enlarged



CHESTNUT OAK

CHESTNUT OAK

QUERCUS PRINUS *Linnæus*

FAMILY.—Beech.

OTHER NAMES.—Rock Oak; Rock Chestnut Oak.

GENERAL DESCRIPTION.—*Shape:* straight, continuous, heavy trunk, bearing a broad, open crown. *Height:* 60 to 70, sometimes 100 feet, with a diameter of 6 to 7 feet. *Bark:* on old trunks brown to black, very rough, deeply furrowed, and rich in tannin. *Buds:* alternate, ¼ to ½ of an inch long, sharp-pointed, covered with light chestnut-brown scales. *Leaves:* alternate, simple, 5 to 9 inches long, 2 to 4 inches wide, coarsely-toothed on margin. *Flowers:* appear about May, when leaves are a third developed; pollen-bearing, are yellow and occur in drooping tassels, 2 to 3 inches long. *Fruit:* short-stalked acorn maturing in one season; nut sometimes 1½ inch long, usually 2 to 3 times as long as broad; acorn-cup thin, hemispheric, hairy inside, and covers 1/3 of nut.

PREFERRED HABITAT.—Dry hillsides and moist, fertile foot-hills.

RANGE.—Maine to Ontario, south to Alabama and Tennessee.

THE name Chestnut Oak was given to this tree because its leaves resemble those of the common Chestnut, a fact which enables one to recognize it at a glance.

It belongs to the White Oak group, the members of which are recognized by their round-lobed leaves and the fact that their acorns mature in one season, while the Oaks belonging to the Black Oak group mature their acorns in two seasons.

The Chestnut Oak may be distinguished at any season of the year by its bark. On young stems it is smooth, thin, and yellowish brown. On old trunks it is thick, brown to black, and deeply furrowed. The ridges between the furrows are sharp-angled, solid, and not scaly. The bottom of the furrows is often cinnamon-red in color, a characteristic not found in any other Oak.

In winter the Chestnut Oak can always be distinguished by its slender, angular, orange-brown twigs terminated by a cluster of light-brown, sharp-pointed buds, about ¼ to ½ of an inch long.

The Chestnut Oak is also called Rock Oak; a name probably given to it on account of the hard wood it produces or the rocky situations upon which it usually occurs. It is an important forest tree, for it grows rather rapidly, produces valuable wood, and yields bark which is rich in tannin.

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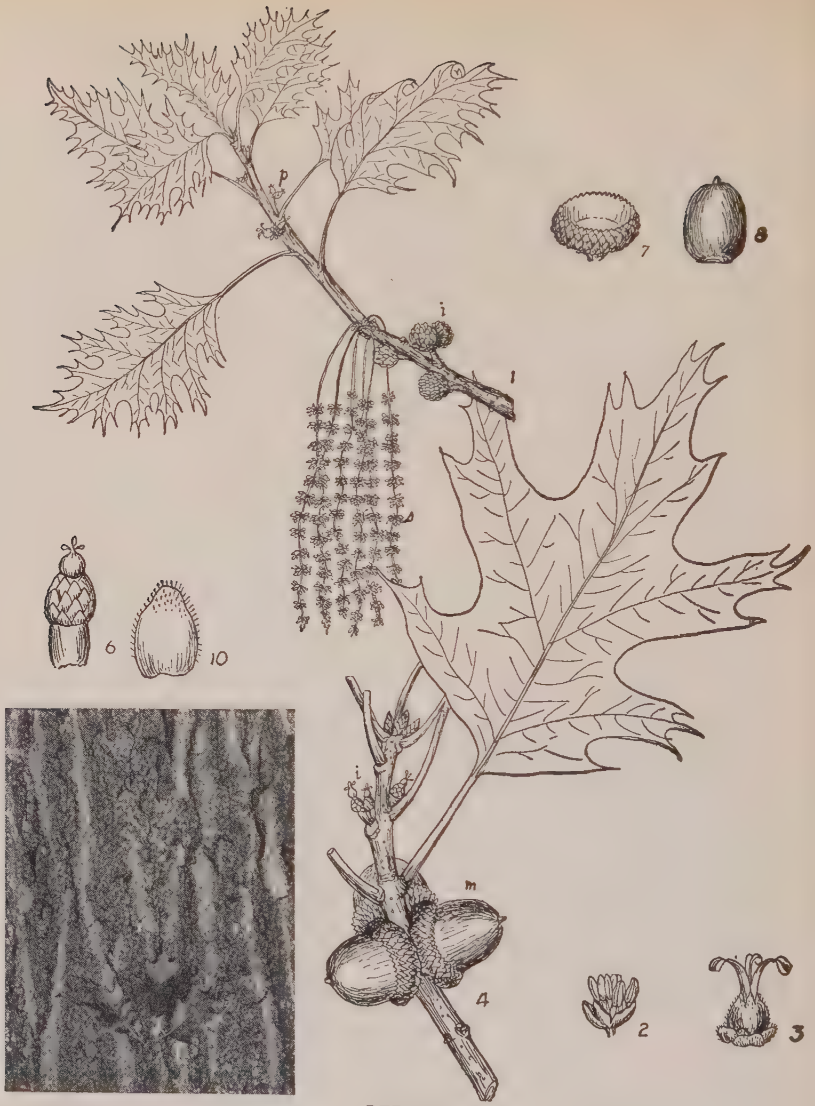
1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms; 2 = branch with mature leaves and mature acorns; 3 = an acorn cup; 4 = an acorn; 9 = an apical bud-scale with hairy margin, enlarged.



RED OAK

1 = Flowering branch with immature leaves, (s) staminate blossoms (p) pistillate blossoms; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = branch with mature leaves, (i) immature acorns, (m) mature acorns; 6 = an immature acorn, enlarged; 7 = an acorn cup; 8 = an acorn; 10 = a bud-scale, enlarged

RED OAK

QUERCUS RUBRA *Linnæus*

FAMILY.—Beech.

GENERAL DESCRIPTION.—*Shape:* When grown in the open, trunk is short, and crown broad and symmetrical; in dense stands trunk is straight, clean and continuous, and the crown shallow and narrow. *Height:* sometimes 150 feet. *Age:* frequently becomes 300 and occasionally 400 years. *Bark:* on large trunks thick, dark-brown, furrowed, with flat-topped ridges; on small trunks and branches smooth and grayish-brown. *Pith:* star-shaped. *Buds:* alternate, reddish-brown, sharp-pointed, ¼ of an inch long. *Leaves:* alternate, simple, 5 to 9 inches long, 4 to 6 inches wide, with 7 to 9 bristle-tipped lobes. *Flowers:* appear in April and May; pollen-bearing are yellowish and occur in drooping tassels about 4 inches long; pistillate (female) are reddish, and occur in short-stalked clusters on new growth. *Fruit:* large acorn maturing in two seasons and ripening in September and October; cup wide and shallow; nut large, egg-shaped and light brown.

PREFERRED HABITAT.—Occurs on a wide range of situations, but prefers porous, sandy or gravelly soil.

RANGE.—Found from Nova Scotia to Minnesota and Kansas, and south to Florida and Texas.

THE Red Oak is one of the stateliest, cleanest, and handsomest hardwood trees in America.

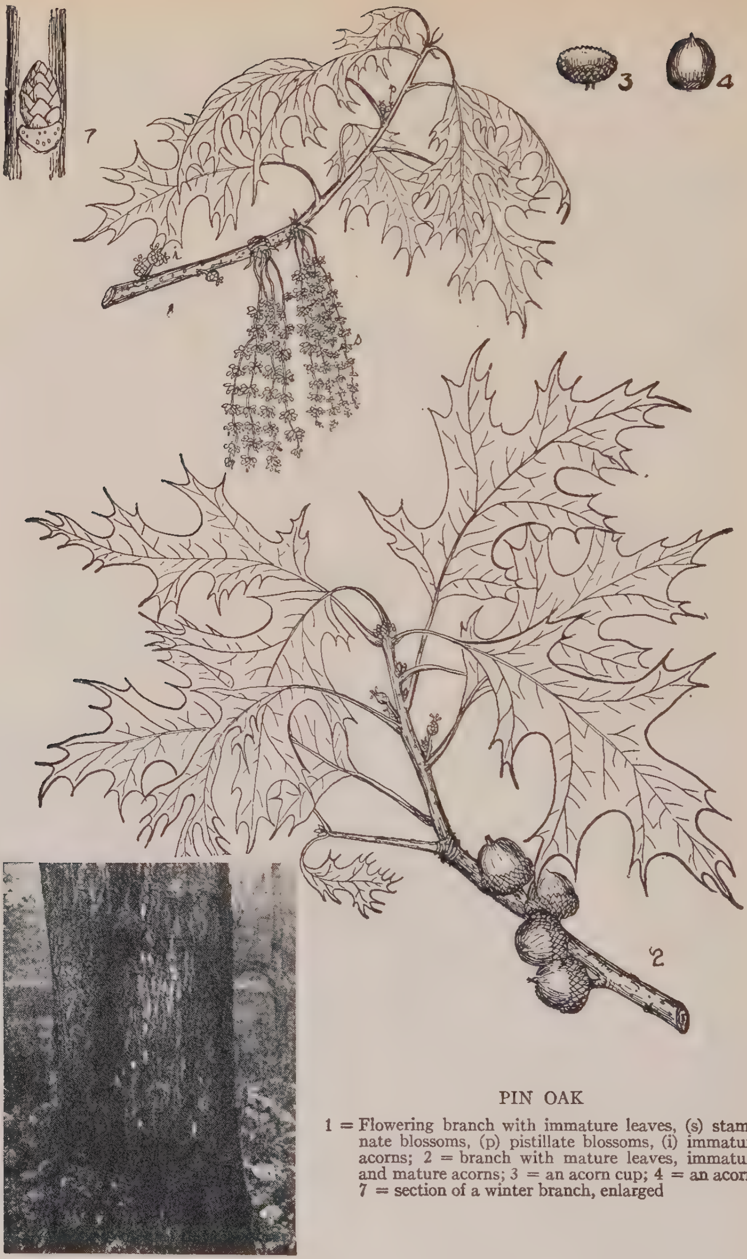
It is one of the most distinctive of the Oaks, and may be recognized by its large dull-green leaves, with reddish midribs and triangular ascending lobes terminated by bristle tips. The bark on old trunk is very characteristic, having smooth and shiny plateau-like plates between the furrowed depressions.

The lateral branches are straight, clean, and smooth, and form an angle of about forty-five degrees with the main stem. The winter buds are very distinctive, being reddish-brown in color, sharp-pointed, and covered with many overlapping smooth scales. The acorns cannot easily be confused with those of any other of the Oaks, for the cups are broad and shallow and the nut large, ovoid, and bright brown.

The wood is heavy, hard, strong, light reddish-brown, and weighs about forty-one pounds per cubic foot.

The Red Oak is one of our most important timber trees. It surpasses all other Oaks in height, diameter, and volume growth, and will thrive on a great variety of soils.

It is the most highly prized of all the American Oaks introduced in Europe, where it has been planted extensively in Belgium, England, and Germany since 1740. It has the widest distribution in the German forests of any American hardwood tree. In the state of Baden alone over 450 acres have been restocked with this tree, and some of these stands are almost one hundred years old.



PIN OAK

1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms, (i) immature acorns; 2 = branch with mature leaves, immature and mature acorns; 3 = an acorn cup; 4 = an acorn 7 = section of a winter branch, enlarged

PIN OAK

QUERCUS PALUSTRIS *Muench*

FAMILY.—Beech.

OTHER NAMES.—Swamp Oak; Swamp Spanish Oak; Water Oak.

GENERAL DESCRIPTION.—*Shape:* straight, clean and continuous trunk bearing a symmetrical conic crown. *Height:* 50 to 60, and sometimes 120 feet, with a diameter of 3 feet. *Bark:* on old trunks rather smooth or slightly roughened; on young trunks shining, very smooth, light brown to reddish. *Buds:* alternate, smooth, 1/3 of an inch long, sharp-pointed, covered with light-brown scales, and clustered at the end of the branches. *Leaves:* alternate, simple, 4 to 6 inches long, 2 to 4 inches wide, 5 to 9 lobed; lobes bristle-pointed, separated by broad, deep, round-based clefts. *Flowers:* appear about May when leaves are 1/3 developed; pollen-bearing occur in slender hairy tassels from 2 to 3 inches long. *Fruit:* an acorn maturing at the end of the second season; nut round, light brown, about ½ of an inch long; acorn is thin, saucer-shaped, shallow, ½ of an inch across, and incloses about 2/5 of nut.

PREFERRED HABITAT.—Rich, moist soil. Common on river bottom-land, along streams, and on border of lakes.

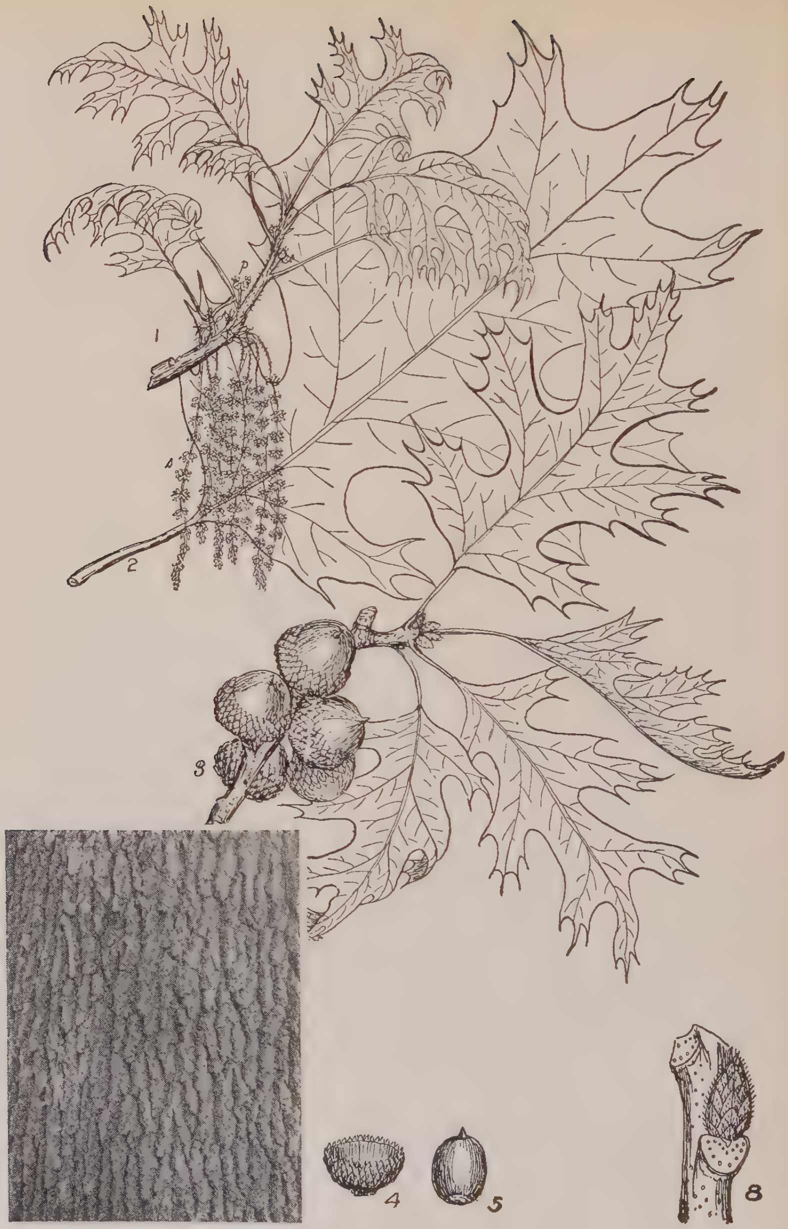
RANGE.—Massachusetts to Michigan and Missouri, south to Virginia, Tennessee, and Oklahoma.

THE Pin Oak is one of the most attractive and graceful Oaks native to the United States. It is planted extensively as a shade, park and avenue tree on account of its rapid growth, distinctive form, attractive foliage, and the ease with which it may be transplanted.

Its preference for low ground and wet places is shown in its common names, Swamp Oak and Water Oak, and in the specific part of its technical name, *palustris*, which means plains or lowlands.

When young and if grown in the open, Pin Oak trees have a distinctive form. It is easy to recognize them at a great distance. The trunk is smooth and continuous. It does not divide and branch as do the trunks of other Oaks. Its lateral branches are slender and relatively short. The lower ones droop, the upper ones stand erect, while those in the middle stand out almost at right-angles to the main stem.

A close examination of its twigs will reveal some striking characteristics. They are usually beset with short, stiff, pin-like spurs, which are responsible for the name Pin Oak. Its small, smooth, sharp-pointed, light-brown buds, and its small, light-brown acorns with shallow cup inclosing one-third of the nut, are also distinguishing characteristics.



BLACK OAK

BLACK OAK

QUERCUS VELUTINA *Lambert*

FAMILY.—Beech.

OTHER NAMES.—Yellow Oak; Quercitron.

GENERAL DESCRIPTION.—*Shape:* narrow to widespreading; irregular, and oblong. *Height:* 60 to 80, sometimes 150 feet, with a diameter of 4½ feet. *Bark:* on young trunks smooth and dark brown; on old trunks thick, rough, and black. Inner bark is yellow and bitter. *Buds:* alternate, 1/3 to ½ of an inch long, strongly angular, and hairy. *Leaves;* alternate, simple, 4 to 6 inches long, 3 to 4 inches wide, usually 7-lobed; each lobe is terminated by bristle points. *Flowers:* appear about May; pollen-bearing, occur in tassels 4 to 6 inches long; pistillate borne solitary or in small groups on short stalks on new growth. *Fruit:* an acorn with an ovate, light, reddish-brown nut, ½ to 1 inch long, contained in a thin, dark, reddish-brown and scaly cup which embraces half of nut.

PREFERRED HABITAT.—Dry uplands, gravelly plains, and ridges.

RANGE.—Maine to Western Ontario, and south to Florida and Texas.

THIS tree has a number of appropriate common names. The name Black Oak refers to the color of the bark on old trunks. It is also called Yellow Oak on account of the yellow inner bark which is always present and a never-failing characteristic.

Before the era of modern dyes the yellow inner bark of Black Oak was used extensively in the manufacture of a yellow dye known as Quercitron. During the World War, when the dye situation was critical, the Black Oak dye business was revived. Many thousands of cords were harvested and manufactured into a vegetable dye used in the dyeing of khaki cloth.

The leaves of Black Oak probably vary more widely in size and form than those of any other oak. The normal leaves are from 4 to 6 inches long, but exceptional leaves become 12 to 16 inches long. All types of leaves, ranging from the deep-lobed form of the Scarlet Oak to the shallow-lobed form of the Red Oak, may sometimes be found upon the same tree.

In autumn the small acorns with the cup covering one-half of the nut, and the scales forming a loose fringe about the margin of the cup, are distinctive. The large, angular buds, covered over their whole surface with pale hairs, are an unfailing distinguishing characteristic in winter.

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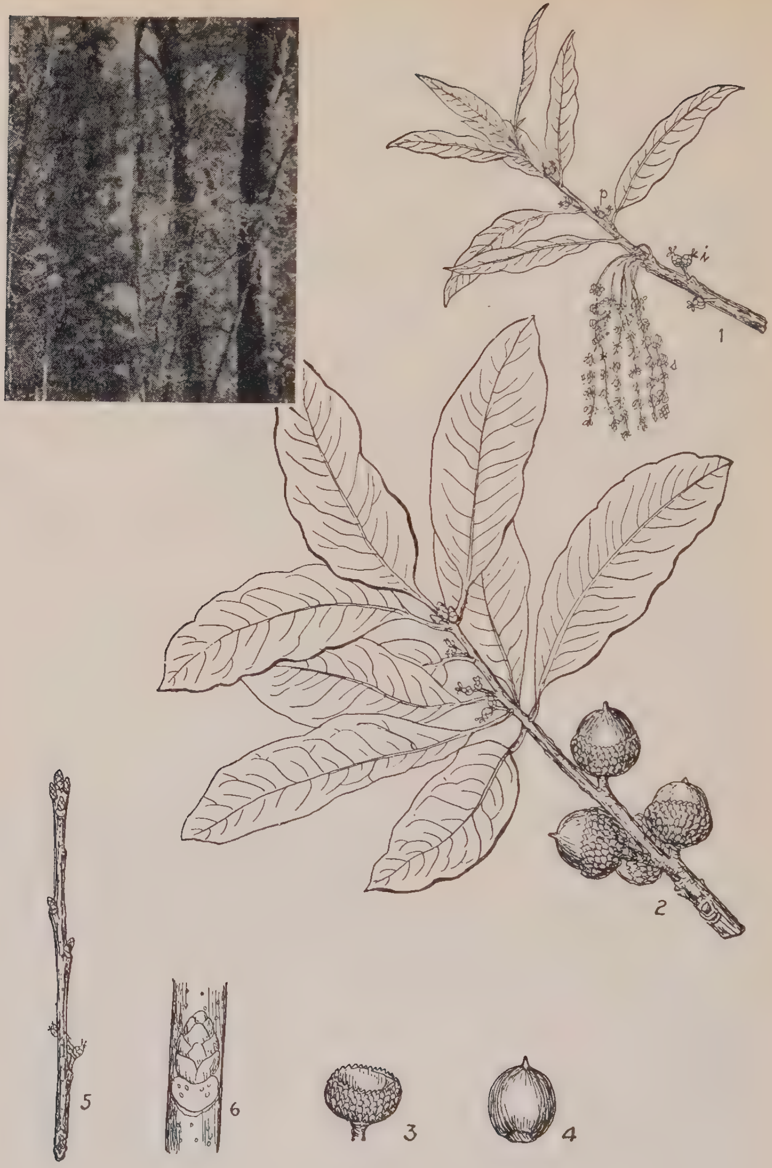
1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms; 2 = a mature leaf; 3 = branch with leaves and mature fruit; 4 = an acorn cup; 5 = an acorn; 8 = section of winter twig showing the large, angular and pubescent bud and leaf-scars with bundle-scars, enlarged

Photo by U. S. Forest Service



LAUREL OAK

LAUREL OAK

QUERCUS IMBRICARIA *Michaux*

FAMILY.—Beech.

OTHER NAMES.—Laurel Oak; Jack Oak; Water Oak.

GENERAL DESCRIPTION.—*Shape:* when young pyramidal; when old broad, open- and shallow-crowned. *Height:* 50 to 60, sometimes 100 feet. *Bark:* grayish-brown, shallow fissured, up to 1½ inch thick. *Buds:* alternate, sharp-pointed, 1/8 of an inch long, covered with numerous chestnut-brown scales. *Leaves:* alternate, thin, dark and shiny above, pale green and hairy below, 4 to 6 inches long, 1 to 2 inches wide, entire on margin. *Flowers:* appear about May; pollen-bearing, occur in hairy tassels 2 to 3 inches long; fruit-producing occur solitary on short stalks on new growth. *Fruit:* a dark-brown, stalked acorn ½ to 1/3 of an inch long; cup incloses almost half of nut.

PREFERRED HABITAT.—Rich bottom-lands and moist, fertile uplands.

RANGE.—Pennsylvania to Michigan and Nebraska, south to Georgia and Arkansas.

THE Laurel Oak is a typical representative of a small group of Oaks which have narrow entire-margined leaves. One who is accustomed only to the form of oak leaves as found in the White, Rock, Red, Scarlet, Pin, and other similar Oaks almost needs to see the acorns on this tree in order to believe that it is really an Oak.

The name "Laurel Oak" was given to this tree because its leaves resemble those of the common Mountain Laurel in form, size, texture, and color. It is also called "Shingle Oak," because in the early days shingles were made locally from it.

The Laurel Oak attains its maximum size in the Mississippi Valley, where it sometimes reaches a height of 100 feet and a diameter of 3 feet. It is distinguished easily by its leaves, which are 4 to 6 inches long, 1 to 2 inches wide, dark and shiny on the upper surface, pale green and hairy on the lower surface, and entire along their margins.

There is another oak—Willow Oak—that has leaves which are somewhat similar to it. The Willow Oak, however, is smaller, has narrower leaves which are also sharper-pointed and not hairy on the lower surface. The acorns of the Laurel Oak are larger and the cups not so flat as those of the Willow Oak. The winter buds of the Laurel Oak are light chestnut brown and somewhat angular, while those of the Willow Oak are dark chestnut brown.

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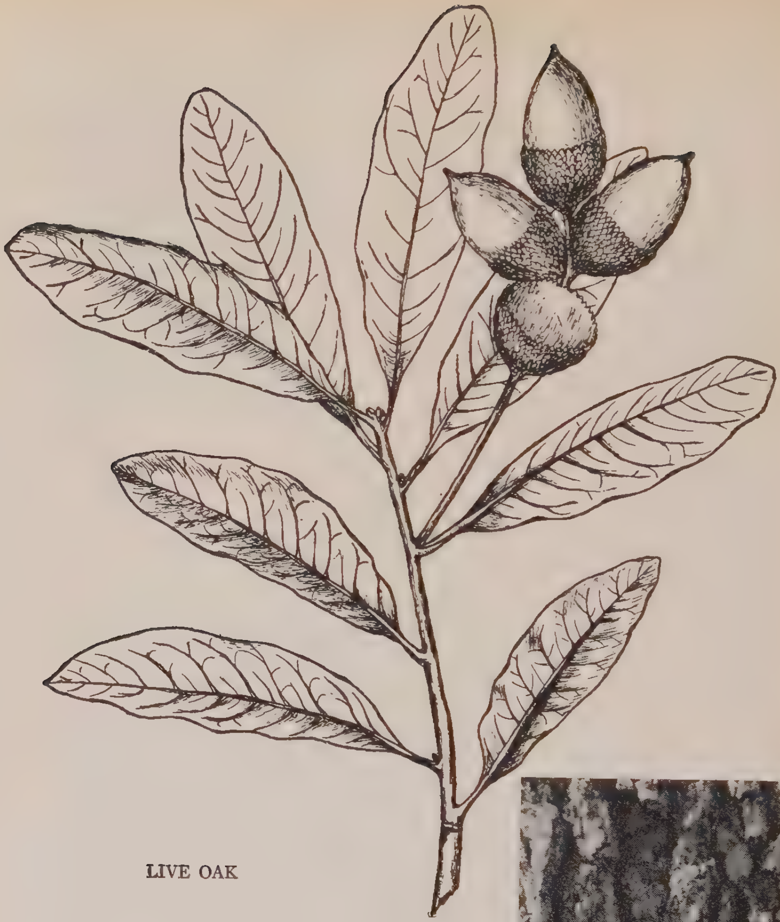
1 = Flowering branch with immature leaves, (s) staminate blossoms, (p) pistillate blossoms, (i) immature acorns; 2 = branch with mature leaves, immature and mature acorns; 3 = an acorn cup; 4 = an acorn; 5 = winter twig with buds, lenticels, pentangular pith and immature acorns: 6 = section of winter twig, enlarged



LIVE OAK

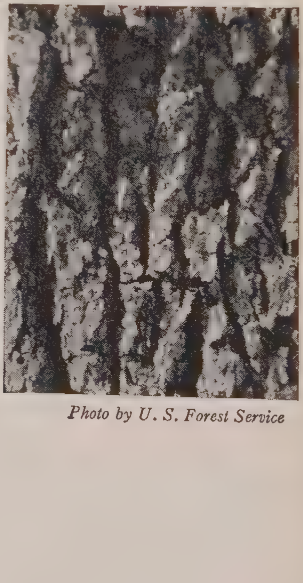


Photo by U. S. Forest Service

LIVE OAK

QUERCUS VIRGINIANA *Mill*

FAMILY.—Beech.

GENERAL DESCRIPTION.—*Shape:* Trunk usually swollen near base and divided a few feet above ground; crown very wide, often 150 feet in width and only 50 feet high. *Height:* usually 40 to 50 feet, with a diameter of 3 to 7 feet. *Age:* 250 to 300 years. *Bark:* on main trunk thick, furrowed, scaly, dark reddish-brown; on twigs and branchlets hairy, light brown to grayish. *Buds:* alternate, 1/6 of an inch long, blunt-pointed, light brown. *Leaves;* alternate, simple, evergreen, thick, leathery, entire-margined or occasionally toothed to spiny at tip, dark green above, white and hairy below. *Flowers:* similar to those of the other Oaks. *Fruit:* an acorn maturing in one year and ripening in September and October; acorn cup incloses 1/3 of nut, which contains a sweet kernel.

PREFERRED HABITAT.—Low, sandy soil, and usually occurs near the coast.

RANGE.—Found along coast from Virginia to Florida, and west to Mexico. Also native to western Cuba.

THE Live Oak, so called because the leaves persist throughout the winter, can readily be recognized at all seasons of the year by its evergreen, leathery and entire-margined leaves, which are green and glossy on the upper surface and whitish and hairy on the lower surface. Its long-stalked acorns, extremely wide-spreading crown, and divided trunk are also helpful distinguishing characteristics. Its branches are frequently laden heavily with drooping clusters of moss, which give a very distinctive appearance to the tree, and account for it being called the grandest and most beautiful tree of the coastal plains region of the Southern States.

Before iron began to play such an important role, the Live Oak was highly prized for ship-building. In the early days of navigation, the Congress of the United States enacted laws for the perpetuation of the supply of this desirable wood, which weighs thirteen pounds per cubic foot more than White Oak, but is so hard, tough, and difficult to work that it is now rarely used.

THE NETTLE FAMILY

URTICACEÆ

THIS family contains a large number of trees, shrubs, and other smaller plants. The trees and shrubs alone comprise more than 1,000 species which occur in temperate and tropical regions of both hemispheres.

The principal groups of trees belonging to this family are:

1. The Elms.
2. The Hackberries.
3. The Mulberries.
4. The Osage Orange.

These four groups have some characteristics in common, but their fruits have little, if any, similarity. No other family of our common trees has so variable and extreme types of fruit. That of the Elm consists of a small dry seed completely surrounded by a thin membrane-like wing; that of the Hackberries is a small edible drupe; that of the Mulberries is a fleshy and edible aggregation of drupes; while that of the Osage Orange is a fleshy, milky, non-edible aggregation of drupes about the size of a large orange. The fruit of the latter is unique among that of our common trees.

THE ELMS

Ulmus

Fifteen species of Elm are known in the world, of which number six are native to North America. The principal species which one may meet in the eastern United States are:

1. American Elm, the favorite tree of the American people.

2. Slippery Elm, so-called because of the mucilaginous inner bark.

3. Cork, or Rock, Elm, which derives its name from the corky-winged projections on the twigs and the extremely hard wood.

4. English Elm, a large and handsome tree introduced from Europe, and a distinctive feature of Boston Common.

The Elms are valuable lumber and shade trees. Some of them produce a tough inner bark which is used for food, in medicine, and manufactured into ropes and coarse cloth. More than ninety-five per cent. of the wooden hoops used on barrels are made of Elm. The wood is also used extensively for barrel staves and headings, agricultural implements, and for a great variety of manufacturing purposes. They deserve to be protected carefully against fire, insects, fungi, and other destructive agencies, and propagated extensively for their valuable wood, excellent shade, and attractive appearance.

American Elm

ULMUS AMERICANA *Linnæus*

FAMILY.—Nettle.

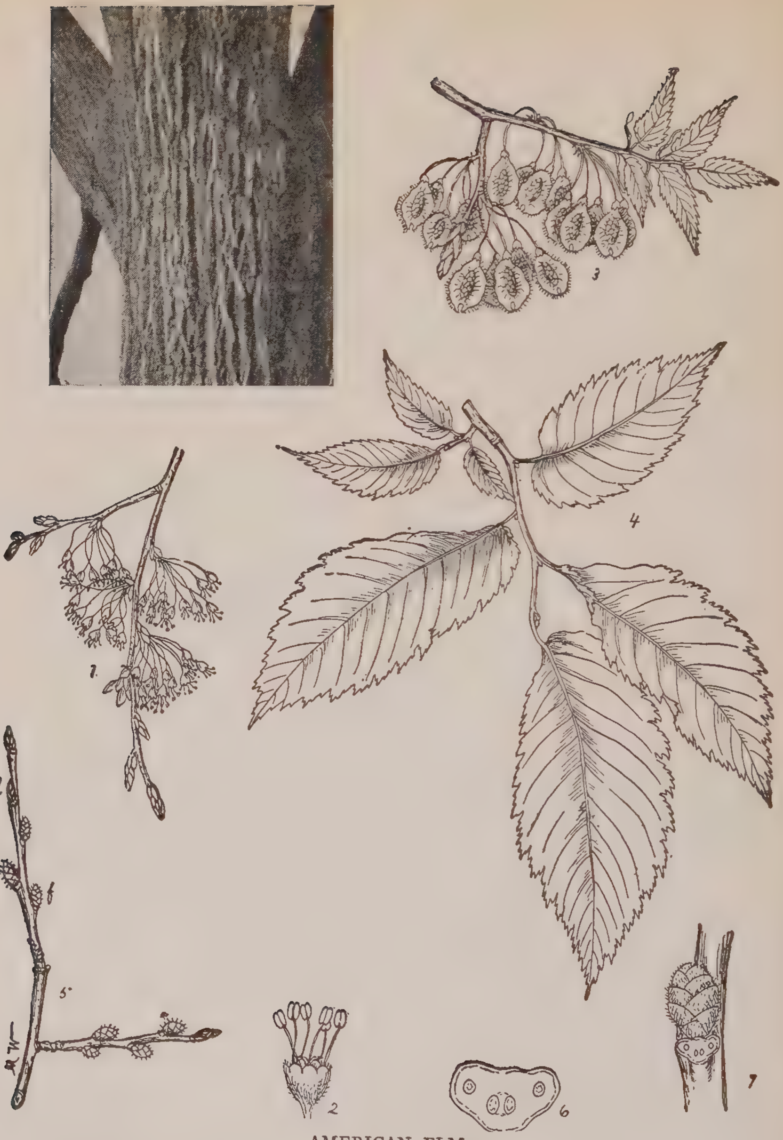
OTHER NAMES.—White Elm; Gray Elm; Water Elm; Swamp Elm.

GENERAL DESCRIPTION.—*Shape:* large, spreading, with graceful, drooping branches; many different ornamental forms are recognized. *Height:* 80 to 100 feet, sometimes 120 feet. *Bark:* grayish, rough, furrowed, usually firm but occasionally flaky. *Buds:* alternate, ovate, about ¼ inch long, covered with 6 to 10 overlapping reddish-brown scales. *Leaves:* alternate, simple, ovate, 4 to 6 inches long, somewhat rough, and oblique base. *Leaf-scars:* semi-circular in outline, corky on surface, and marked with three bundle-scars. *Flowers:* appear in March and April before the leaves. Occur in three- to four-flowered clusters on drooping stalks. *Fruit:* matures early in spring shortly after flowers, consists of a flat seed surrounded by a membrane-like wing.

PREFERRED HABITAT.—Rich, moist bottom-land. Common along streams, borders of lakes and ponds, and in rich soil. Usually mixed with other hardwood trees.

RANGE.—Newfoundland, across Canada to the Rocky Mountains, and south to Florida and Texas.

THE American Elm is generally regarded as the favorite tree of the American people. Michaux, the famous French botanist, called it "the most magnificent vegetable of the temperate zone." It is hardy, grows rapidly, and yields a moderately valuable wood, and has a very wide distribution.



AMERICAN ELM

1 = Flowering branch with leaf-buds; 2 = a flower, enlarged; 3 = branch with mature fruit, immature leaves, and an expanding bud; 4 = branch with mature leaves; 5 = winter twig with (f) flower-buds, and (l) leaf-buds; 6 = a leaf-scar with bundle-scars, enlarged; 7 = section of a winter twig with a slightly pubescent bud, enlarged

This attractive and graceful tree may be recognized at all seasons of the year by its distinctive but rather variable form. In winter, the slender, drooping, reddish-brown twigs bearing small and alternate reddish-brown buds and semi-circular leaf-scars containing three bundle-scars, are helpful distinguishing characteristics. In spring, long before the leaves emerge, the flowers make their appearance in small drooping clusters. The fruit, which appears shortly after the flowers, is also very distinctive. It consists of a small seed, surrounded on all sides by a membrane-like wing.

The leaves are ovate, sharp-pointed at the apex, distinctly saw-tooth-like on the margin, oblique and heart-shaped at the base, and arranged alternately on the slender twigs. The primary and secondary veins are straight, and sunken on the upper surface and projecting on the lower surface.

The American Elm surely holds a prominent place in American history, and its importance is not waning, for it has been planted extensively as a Tribute Tree and Memorial Tree in honor of those who made "the supreme sacrifice" during the World War.

SLIPPERY ELM

ULMUS FULVA *Michaux*

FAMILY.—Nettle.

OTHER NAMES.—Red Elm; Moose Elm.

GENERAL DESCRIPTION.—*Shape:* medium-sized with broad flat crown. *Height:* 40 to 60, sometimes 80 feet. *Bark:* on old trunks thick, dark brown, shallowly fissured; inner bark mucilaginous. *Buds:* alternate, chestnut-brown, ¼ of an inch long, covered with about 12 bud-scales coated with rusty-brown hairs. *Leaves:* alternate, simple, ovate, 5 to 7 inches long, oblique at base, rough in both directions. *Flowers:* appear in short-stalked clusters early in spring before the leaves. *Fruit:* a short-stalked, winged, flat seed, ½ to ¾ of an inch broad.

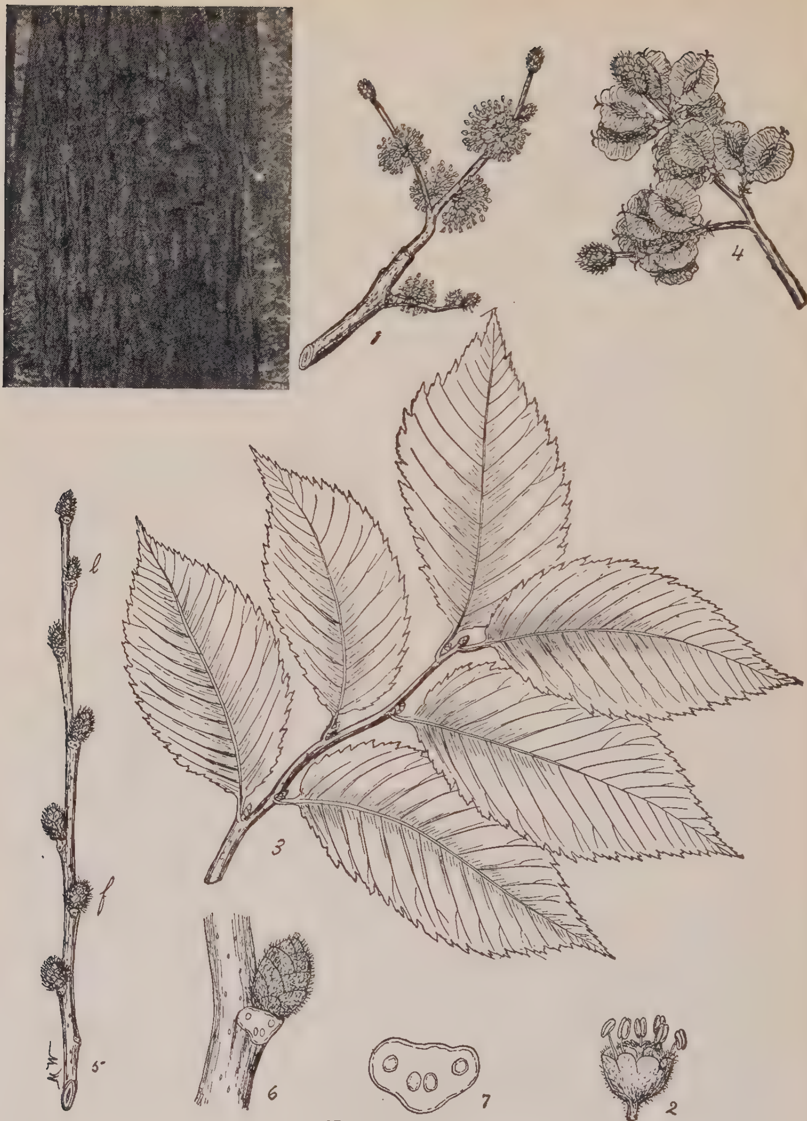
PREFERRED HABITAT.—Low, rich soil along streams and on hillsides. Common on limestone soil.

RANGE.—Valley of Saint Lawrence, south to Florida, west to North Dakota and Texas.

THE Slippery Elm can be distinguished from all other Elms by its fragrant and mucilaginous inner bark. Some Indians called it "oo-hoosh-ab," meaning "it slips."

In winter its dark chestnut-brown buds covered with rusty-brown hairs are a sure means of identification. It is a smaller tree than either the American or Rock Elm, rarely exceeding 50 feet in height and 2 feet in diameter. Its leaves are rough in both directions, while those of the other native Elms are rough in one direction only.

The general appearance of the Slippery Elm enables one to distinguish



SLIPPERY ELM

1 = A flowering branch; 2 = a flower, enlarged; 3 = branch with mature leaves; 4 = branch with mature fruit and expanding leaf-buds; 5 = winter twig with (f) flower-buds, and (l) leaf-buds; 6 = section of a winter twig with a densely pubescent bud, enlarged; 7 = a leaf-scar with bundle-scars, enlarged

it readily from the American Elm, for its lateral branches are rather straight and ascending while those of the American Elm are drooping. In many parts of its range it thrives wherever an outcrop of limestone soil occurs. It likes limestone soil, while such trees as Chestnut and Pitch Pine are not found in soils charged heavily with lime.

The Slippery Elm is a widely distributed forest tree, being native from the valley of the St. Lawrence to North Dakota and south to Florida and Texas. Its wide natural range, coupled with the fact that it grows rapidly, produces durable wood of a fair quality, and has few insect enemies, suggests a promising future for this tree.

Rock Elm

Ulmus racemosa *Thomas*

Family.—Nettle.

Other Names.—Cork Elm; Hickory Elm; Hard Elm.

General Description.—*Shape:* heavy-trunked with narrow, oblong crown. *Height:* sometimes reaches 100 feet with a diameter of 5 feet. *Bark:* on the main trunk thick and grayish with wide furrows separating scaly ridges; on the branches reddish-brown, lustrous with corky wing-like projections. *Buds:* egg-shaped, sharp-pointed; brown, about ¼ of an inch long. *Leaves:* alternate, simple, 3 to 6 inches long, about 2 inches wide; coarsely-toothed on margin, unequal-based, dark green above, pale and hairy beneath. *Flowers:* appear March to April before the leaves; borne on slender drooping stalks in loose clusters. *Fruit:* a one-seeded samara about ½ of an inch across; seed surrounded completely by a membranous wing and covered completely with hairs; ripens about May.

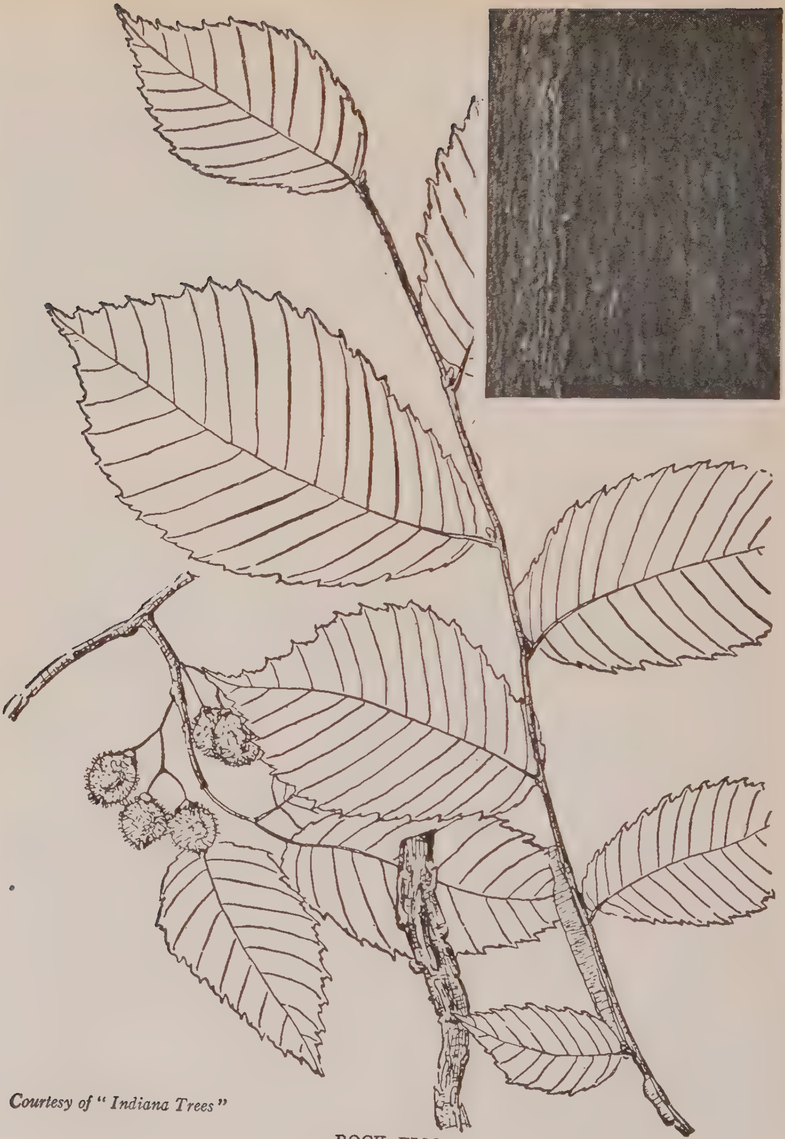
Preferred Habitat.—Dry, gravelly uplands, rocky ridges and slopes. Occurs also on heavy clay soils and river banks.

Range.—Quebec, Vermont, and northern New York to southern Michigan and Wisconsin, south to Nebraska, Missouri, and middle Tennessee.

The striking feature which distinguishes the Rock Elm from all other Elms in northeastern United States is the corky-winged projections found upon the twigs and smaller branches. These corky-winged projections give the tree an entirely different appearance than that of any other associated tree, and account for its common name, Cork Elm, which was used almost exclusively until lumbermen began calling it Rock Elm.

When at its best, the Rock Elm compares favorably in size and dignity to the American Elm, but lacks some of the grace of the latter species. It may reach a height of 100 feet and a diameter of 3 feet, and produces heavy, hard, and close-grained wood which is used for a great variety of purposes. On account of the excellent wood produced by this tree it is sometimes called Hickory Elm. Occasionally it is found growing on rocky ledges, which accounts for its other common name, Cliff Elm.

For a long while this tree was planted extensively for shade and ornamental purposes. It grows rapidly and has other merits, but it also has a



Courtesy of " Indiana Trees "

ROCK ELM

bad habit in that it sends its roots out great distances near the surface of the ground in search of water, and from them spring up numerous "sucker sprouts" which are difficult to destroy and have ruined many a garden and lawn.

THE HACKBERRIES

CELTIS

There are sixty different species of Hackberries in the world, of which nine are native to North America. Representatives are found in the temperate and tropical regions both of the eastern and western hemispheres. They are especially famed for their sweet berries, which are a source of food to man, and the wild animals of the field and forest.

A number of the native species attain a large tree size, and one of them, known as the Sugarberry (*Celtis mississippiensis*), is a favorite host of the Common Mistletoe, used so extensively for Christmas decorative purposes. The Misletoe is a parasitic plant, sometimes called Tree-thief, and draws all its nourishment from the tree upon which it lives. In the Southwest it is not unusual to find the branches of a Hackberry tree literally dotted with dense clusters of this parasitic woody flowering plant.

HACKBERRY

CELTIS OCCIDENTALIS *Linnæus*

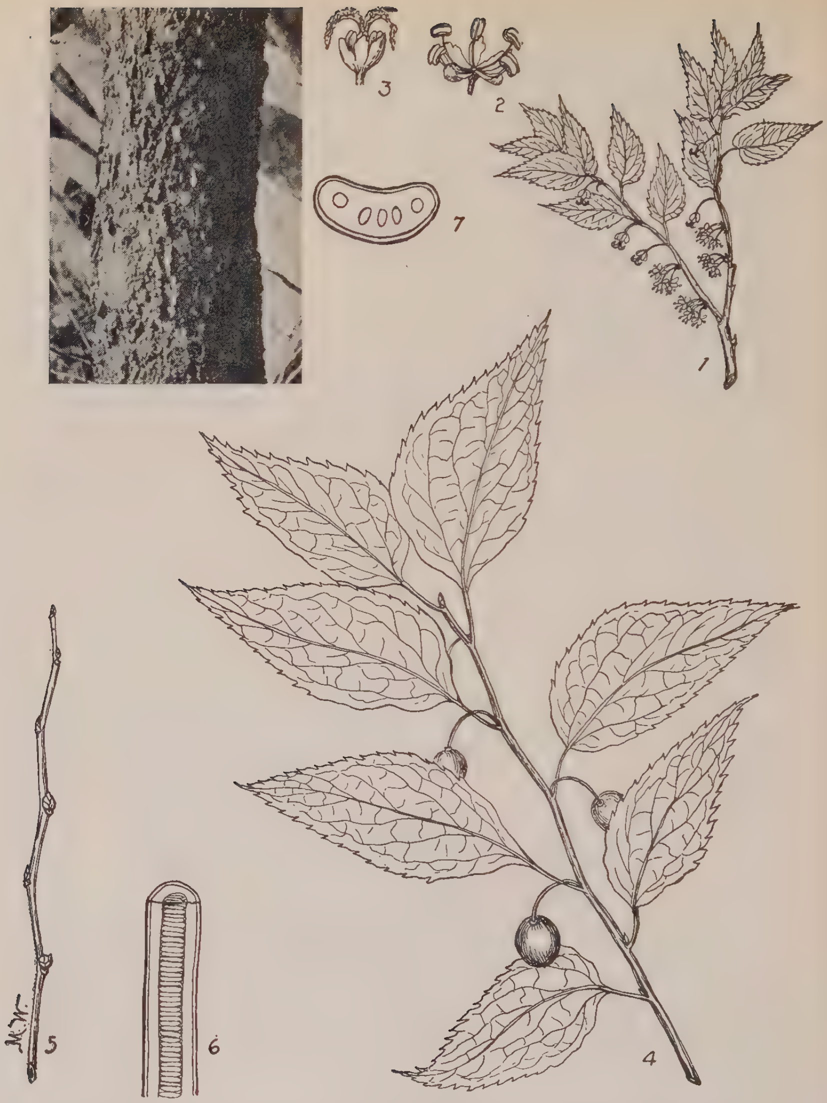
FAMILY.—Nettle.

OTHER NAMES.—Sugarberry; Nettle-tree; Hoop Ash; Hack-tree; Bastard Elm.

GENERAL DESCRIPTION.—*Shape:* wide-spreading and round-topped. *Height:* 40 to 50, sometimes 80 feet. *Bark:* grayish-brown, usually roughened by hard, warty projections. *Buds:* alternate, small, ovate, flattened, covered with 3 to 4 scales; often swollen and malformed, due to insect-galls. *Leaves:* alternate, simple, ovate, 2 to 4 inches long, sharp-pointed, and rough on upper surface. *Leaf-scars:* small, semi-oval, with 1 to 3 bundle-scars. *Flowers:* appear about May, are greenish, and occur in clusters on drooping stalks. *Fruit:* a small dark purple, round, sweet berry, which matures about September.

PREFERRED HABITAT.—Rich and rather moist soil, but may occur on gravelly soil; usually mixed with other hardwood trees.

RANGE.—Greater part of the United States east of the Rocky Mountains.



HACKBERRY .

1 = Branch with immature leaves, staminate and pistillate flowers; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = a branch with mature leaves and mature fruit; 5 = a winter twig; 6 = section of a winter twig showing chambered pith, enlarged; 7 = a leaf-scar with bundle-scars, enlarged

The Hackberry has one characteristic common to only a few trees native to the United States, viz., its *pith is chambered.* If one takes a twig and cuts it lengthwise through the center the pith will be shown as a series of white partitions separating empty chambers. The Black Walnut and Butternut are other common American trees which possess this unusual characteristic.

The leaves resemble those of the Elms, but are smaller, more slender, and sharper-pointed. Its fruit is a solitary, one-seeded, purplish, sweet drupe, which often persists far into winter and furnishes delicious food to wild birds. Witches-brooms and abnormally swollen buds are very common upon this tree. They are caused by the sting of small gall-insects. It is often possible to recognize this tree at a great distance by the clusters of twigs which may be scattered throughout the crown in large numbers. The rough, hard, and wart-like projections upon the bark of the young trunks is also a reliable means of identification.

The wood is similar to that of the Elms in structure, but resembles the Ashes in appearance. It is usually sold on the market as Ash, and is used in the manufacture of crates, boxes, cooperage, handles, and agricultural implements.

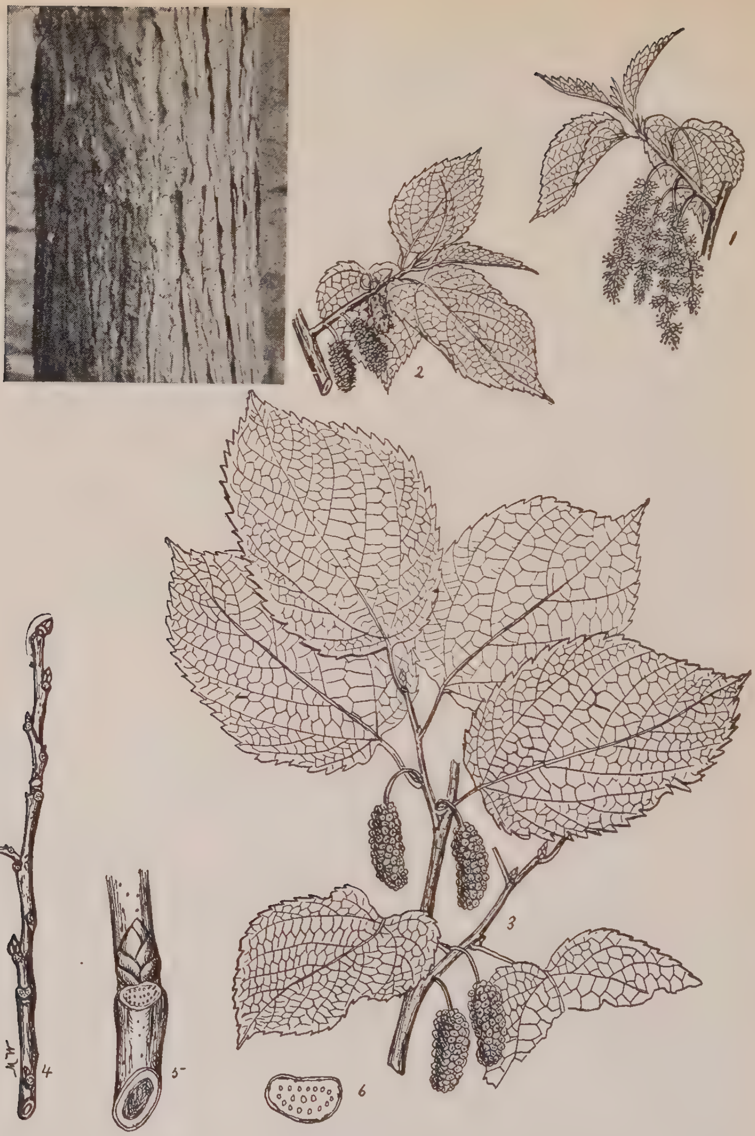
The food which the Hackberry tree supplies to birds during the winter months, when other food is scarce, will more than justify all efforts put forth in its protection and propagation.

THE MULBERRIES

Morus

There are ten different species of Mulberries found in the world, but only three of them are native to North America. Representatives of this group of trees and shrubs are native to eastern North America, Central America, South America, Europe, and Asia. They are most abundant in Asia, which is the home of the common White Mulberry (*Morus alba*, L.), planted so extensively in eastern North America, where it has escaped cultivation in many places.

The wood is exceedingly durable, and is largely used by boat-builders, coopers, and implement makers.



RED MULBERRY

1 = Branch with immature leaves and four staminate flower spikes; 2 = branch with immature leaves and three pistillate flower spikes; 3 = branch with mature leaves and mature fruit; 4 = a winter twig; 5 = section of a winter twig, enlarged; 6 = a leaf-scar with bundle-scars, enlarged

RED MULBERRY

MORUS RUBRA *Linnæus*

FAMILY.—Nettle.

OTHER NAMES.—Mulberry; Black Mulberry.

GENERAL DESCRIPTION.—*Shape:* broad and round; trunk usually divides near ground. *Height:* 35 to 50, sometimes 70 feet. *Bark:* rather thin, grayish-brown, flaky. *Buds:* alternate, ovate, about 2/5 of an inch long, covered by 3 to 9 greenish to reddish-brown scales. *Leaves:* alternate, simple, ovate, 3 to 5 inches long, heart-shaped, and often oblique at base; veins very prominent, and exude a milky secretion. *Leaf-scars:* raised on enlargement of twigs, hollow, almost circular. *Flowers:* appear in May and June, and occur in dense spikes. *Fruit:* an aggregation of small drupes about 1 inch long; at first green, then red, and finally dark purple, juicy and edible.

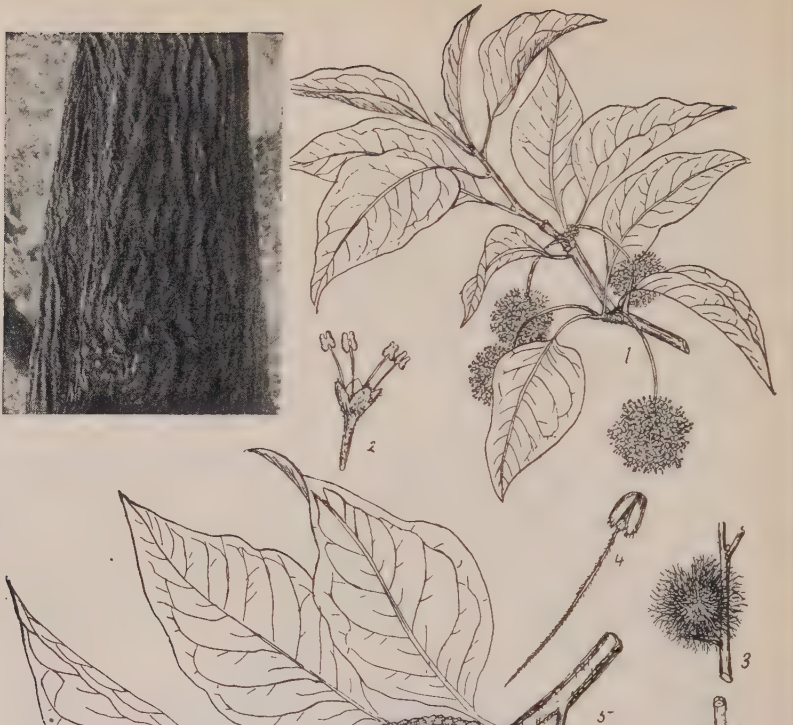
PREFERRED HABITAT.—Rich, moist soil; usually occurs with other hardwood trees in valleys and on foot-hills.

RANGE.—Massachusetts to Florida, and west to Kansas and Nebraska.

THE Red Mulberry is the only species of Mulberry native to the eastern United States. In summer, the large, roundish, sharp-tipped leaves, with deeply sunken veins on the upper surface, are distinctive. Some of the leaves are lobed and resemble an ordinary mitten in outline. The most positive distinguishing characteristic of the leaves is a milky secretion which flows from the cut section of the leaf-stalk. The seed-bearing flowers develop into a purplish, aggregate fruit, which is the most distinctive product of the tree.

In winter the Red Mulberry is not particularly attractive, but it can readily be distinguished if its twigs are examined closely. They are very smooth, clean, and light greenish-brown. They bear oval and hollow leaf-scars, which contain a large number of bundle-scars arranged in a closed ellipse.

The Red Mulberry cannot be classified as an important timber tree, but it has many useful qualities. The fruit is valued for fattening hogs and poultry. Many a weary harvester has found shelter under its crown, and been refreshed by its fruit.



OSAGE ORANGE

OSAGE ORANGE

MACLURA POMIFERA *Schneider*

FAMILY.—Nettle.

OTHER NAMES.—Hedge-tree; Yellow-wood; Osage Apple Tree; Bow-wood; Bois d'Arc.

GENERAL DESCRIPTION.—*Shape:* round-topped, rather open and irregular. *Height:* 30 to 40, sometimes 60 feet. *Bark:* pale to yellowish-brown and dark gray, evidently fissured, bearing scattered stout spines. *Buds:* alternate, broad, globular, covered with 5 to 7 chestnut-brown scales. *Leaves:* alternate, simple, ovate, about 4 inches long, smooth dark green, entire on margin, acute at apex, and wedge-shaped at base. *Leaf-scars:* small, broadly triangular to elliptical, containing 1 to 3 bundle-scars, and located on twig enlargements. *Flowers:* appear about June, occur in dense stalked heads. *Fruit:* an aggregation of drupes, orange-like in appearance, 4 to 5 inches in diameter.

PREFERRED HABITAT.—Very modest in its soil demands, but makes best growth on fertile flats.

RANGE.—Oklahoma, south to Dallas, Texas. Planted in almost every State east of the Rocky Mountains.

THE historians tell us that the Osage Orange, which is the only tree of its kind in the world, was used by the Indians for clubs and bows long before the white man discovered America. It is not prized because of the valuable wood which it produces, or the great size it attains, but the tree is really interesting from root to fruit. The bark of the roots is of a deep orange color, and yields a valuable dye. The wood is also rich yellow in color, sometimes streaked with red. It is one of the hardest, strongest, and most durable woods native to North America, and is locally used for fence posts, wagon-felloes, and insulator pins. Police clubs and tobacco pipes are made from it. The bark on the trunk is furrowed and scaly, and contains some tannin.

Its fruit is one of the most unique known to science. In size and form it resembles a large orange. At first it is green in color, but when mature it becomes yellowish, and if bruised it exudes a milky secretion which turns black very rapidly.

Another distinctive feature of the tree is its thorns. They are straight, stiff, sharp-pointed, originate in the axils of the leaves, and possess an unusual lacerating power.

The Osage Orange is free from insect enemies and fungal foes. In fact, it is so vigorous that it is difficult to eradicate it, where it is thoroughly established.

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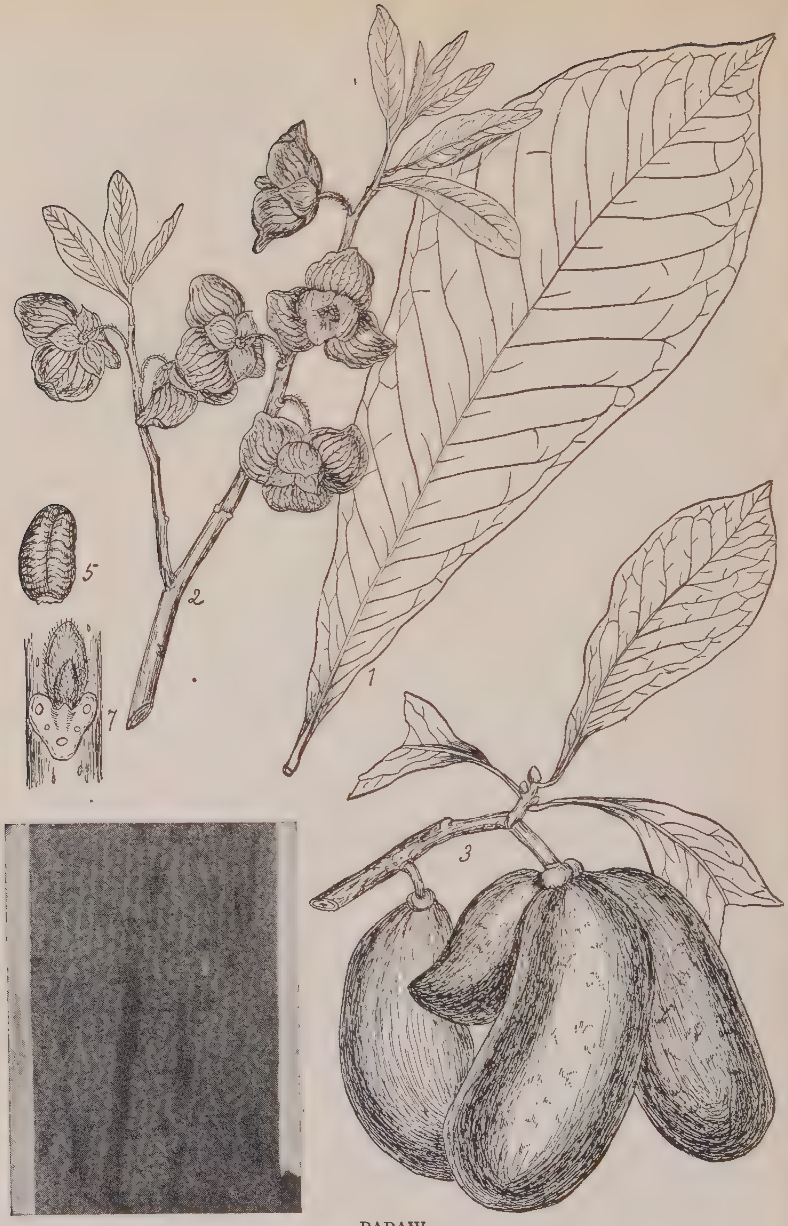
1 = Branch with immature leaves and heads of staminate flowers; 2 = a staminate flower, enlarged; 3 = branch with a head of pistillate flowers; 4 = a pistillate flower, enlarged; 5 = branch with mature leaves and a single mature fruit; 6 = a winter twig with three thorns; 7 = section of a winter twig showing lenticels, buds, and leaf-scars with bundle-scars, enlarged



PAPAW

CUSTARD APPLE FAMILY

ASIMINA

PAPAW

ASIMINA TRILOBA *Dunal*

FAMILY.—Custard Apple.

GENERAL DESCRIPTION.—*Shape:* short trunk bearing low, broad crown. *Height:* 10 to 40 feet. *Bark:* thin, dark brown, slightly furrowed, often white blotched. *Buds:* alternate, brown, naked, hairy; terminal buds long and flat; flower buds round, dark-brown, about one-sixth of an inch in diameter. *Leaves:* alternate, simple, 4 to 12 inches long, pointed at apex, tapering at base, entire on margin. *Flowers:* appear April to May; occur solitary, at first green, later reddish-purple, 1 to 1½ inch wide. *Fruit:* suggest a stubby banana, is pulpy, edible, at first green, later yellowish brown, 3 to 5 inches long, contains many dark-brown seeds.

PREFERRED HABITAT.—Rich, moist situations. Common along streams and low fertile slopes.

RANGE.—Western New York and New Jersey to Florida, and west to Michigan, Kansas, and Texas.

A FOREST tree must do one of two things to maintain itself. It must grow up high and enjoy the sunlight, or it must learn to endure shade. The Papaw has elected to do the latter, for one usually finds it growing under the cover of larger trees, or in groups in meadows and abandoned fields, and along the border of woodlands.

The best time to identify the Papaw is in fall, when its unique fruit, which resembles a stubby banana, is at hand. The fruit is 3 to 5 inches long, has an edible pulp containing many brown seeds, and is covered with a firm skin which is at first green but becomes yellowish-brown when ripe. The blossoms are as interesting as the fruit. They occur solitary, measure about 1½ inch across, are greenish-purple at first, but upon maturing become reddish-purple.

In summer the Papaw may be identified easily by its large, tropical-like and alternately arranged leaves. In winter the long, slender, somewhat flattened, naked brown buds are a positive means of identification. The flower buds, about the size and shape of a small pea, and the U-shaped leaf-scars enable one to distinguish it from all its associates.

The Papaw is the most northern member of the genus *Asimina*, which is the only genus of the Custard Apple Family found outside the tropics.

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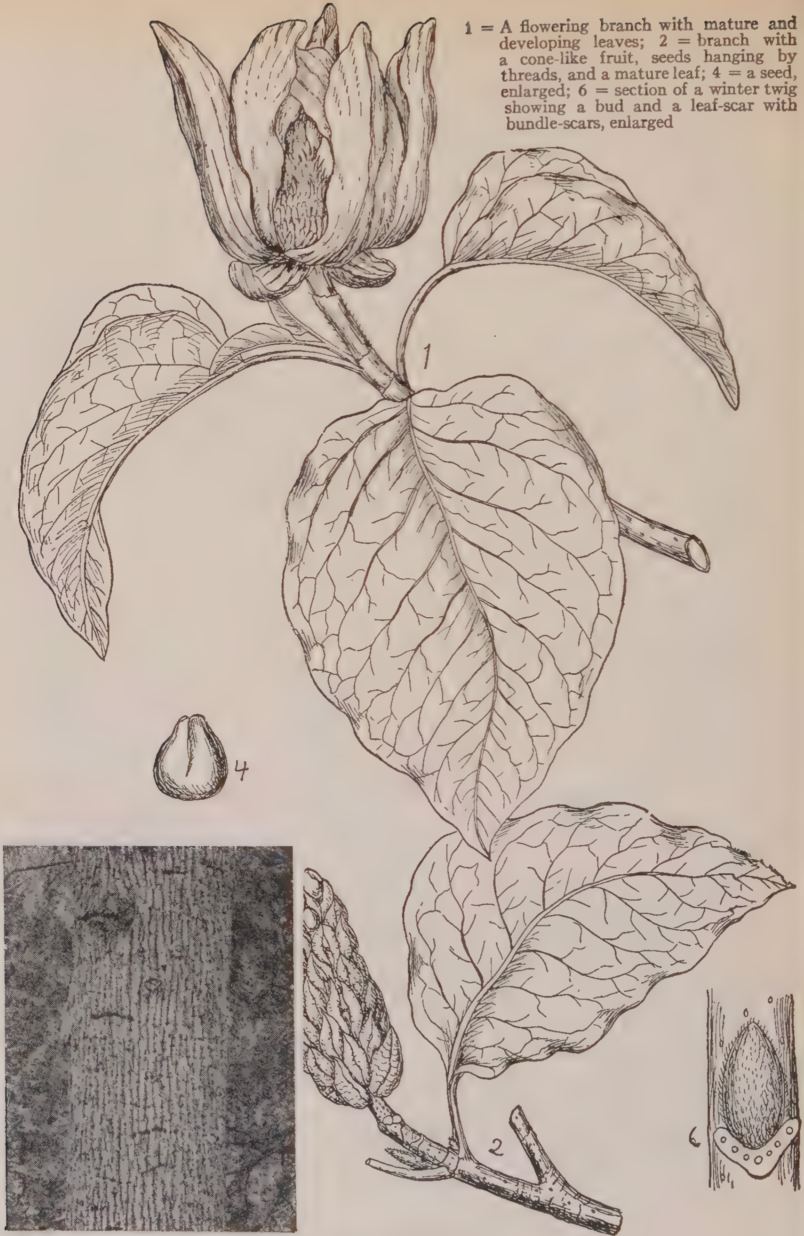
1 = A mature leaf; 2 = a flowering branch with immature leaves; 3 = a fruiting branch; 5 = a seed, natural size; 7 = section of a winter twig, enlarged

1 = A flowering branch with mature and developing leaves; 2 = branch with a cone-like fruit, seeds hanging by threads, and a mature leaf; 4 = a seed, enlarged; 6 = section of a winter twig showing a bud and a leaf-scar with bundle-scars, enlarged



CUCUMBER TREE

THE MAGNOLIA FAMILY

MAGNOLIACEÆ

THE Magnolia Family comprises ten different groups of trees and shrubs, which are widely distributed in temperate and tropical regions. There are, however, only two different groups of these trees in the native flora of North America, viz.:

1. The Magnolias.
2. The Tulip Tree.

The Magnolias are among the most beautiful trees native to the eastern part of North America. All of them produce beautiful large flowers, and bear large, deep-green, tropical-like leaves. They derived their name from Pierre Magnol, a famous French botanist, who was a professor of botany in Montpelier, and died in 1715. Representatives of these attractive trees are native to eastern North America, southern Mexico, the West Indies, and Asia. Some of the most attractive and extensively used ornamental varieties of Magnolia have been developed from species native to eastern Asia. They are now being used everywhere for out-of-door planting and interior decoration, and possess the largest flowers of any tree in cultivation.

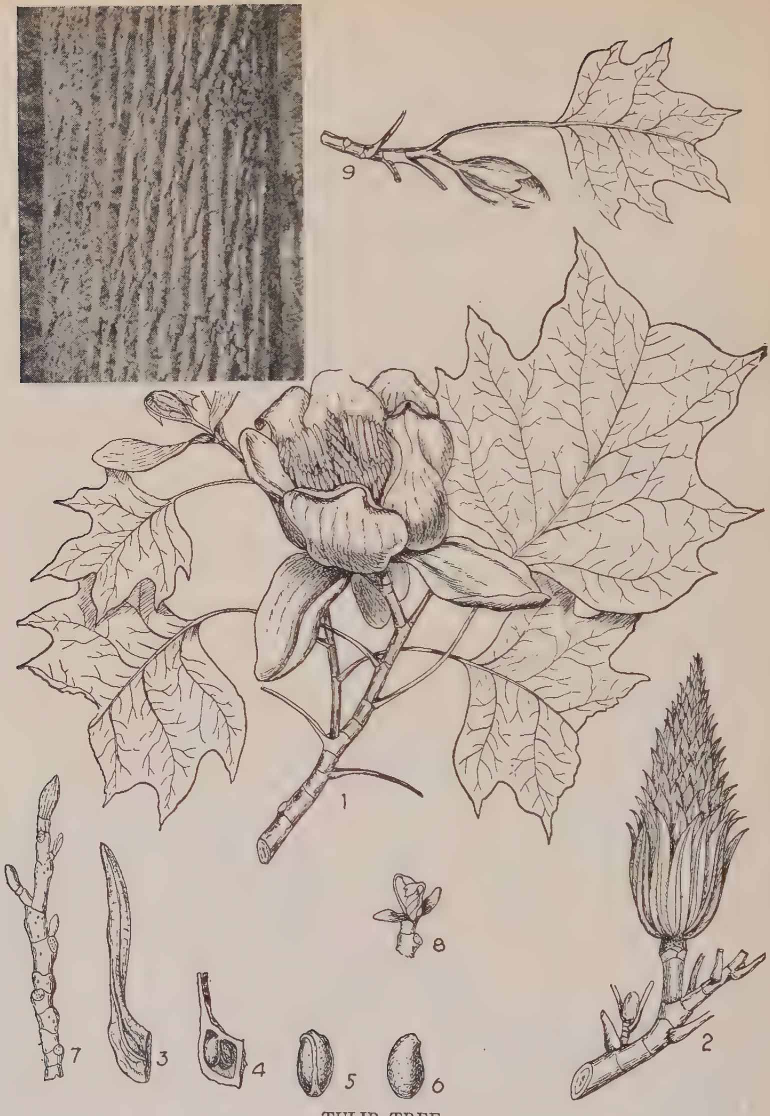
CUCUMBER TREE

MAGNOLIA ACUMINATA *Linnæus*

FAMILY.—Magnolia.

OTHER NAMES.—Mountain Magnolia; Cucumber; Magnolia.

GENERAL DESCRIPTION.—*Shape:* pyramid-like in open situations; in dense stands crown is broad and shallow. *Height:* 60 to 70, sometimes 120 feet, with a diameter of 4 feet. *Bark:* grayish-brown, deeply furrowed, loose, and somewhat scaly. *Buds:* alternate, long, slender, hairy, sharp-pointed, about 3/5 of an inch long. *Leaves:* alternate,



TULIP TREE

1 = A flowering branch with mature and developing leaves; 2 = branch with a cone-like fruit; 3 = a single carpel, natural size; 4 = portion of a carpel showing seeds, natural size; 5 = a seed, enlarged; 6 = side view of a seed, enlarged; 7 = a winter twig; 8 = a terminal bud, just opening; 9 = a twig showing developing leaves simple, ovate, sharp-pointed, thin, 6 to 12 inches long, and 3 to 5 inches wide. *Leaf-scars:* crescent to broadly V-shaped with 6 to 8 bundle-scars. *Flowers:* appear from April to June, slender bell-shaped, greenish, tinged with creamy yellow, about 3 inches long. *Fruit:* matures about October, somewhat resembles a cucumber, about 2½ inches long, contains numerous seeds which are scarlet red when mature.

PREFERRED HABITAT.—Rich woods close to streams and on dry slopes.

RANGE.—Western New York and southern Ontario, south to Georgia and Arkansas.

THE Cucumber Tree obtained its common name from its unique fruit, which when green somewhat resembles an ordinary cucumber.

When grown in a dense stand it rises straight up for thirty to fifty feet without a branch. On the other hand, if developed in an open situation the lateral branches start low along the trunk, and the resulting crown is high and pyramid-like.

In summer the large tropical-like leaves, and the large greenish-yellow flowers are a sure means of identification. After the petals have fallen the curious fruit begins to develop. It resembles a cucumber. About September it turns pink, and the covering shows many small cracks from which little red berries break forth.

The smooth and bitter twigs bearing long, slender and somewhat hairy buds and crescent-shaped leaf-scars are very helpful means of identifying the tree in winter. The grayish-brown and long-furrowed bark on the trunks of trees is at hand at all seasons of the year, and will enable anyone to recognize this fine forest tree.

The Cucumber Tree is the most important forest tree of all the Magnolias. The wood is similar to that of the Tulip Tree, and usually sold upon the market as Yellow Poplar. It grows rapidly, attains a large size, is easily propagated, and has few insect and fungous enemies. It is a magnificent tree for lawn and park planting.

TULIP TREE

LIRIODENDRON TULIPIFERA *Linnæus*

FAMILY.—Magnolia.

OTHER NAMES.—Yellow Poplar; Tulip Poplar; Whitewood; Poplar; Popple.

GENERAL DESCRIPTION.—*Shape:* pyramid-like to broad and spreading. *Height:* 60 to 150 feet. *Bark:* on young trees smooth, bitter, ashy-gray, and mottled with light spots; on old trees thick, rough, and furrowed. *Buds:* alternate, large, smooth, flattened, blunt-pointed and covered with one pair of leaf-like scales. *Leaves:* alternate, simple, broad, 4 to 6 lobed, apparently cut off at apex. *Flowers:* mature in May and June; large, tulip-like, greenish-yellow, with 3 sepals and 6 petals. *Fruit:* matures in September and October, cone-like, light-brown, about 3 inches long, and often persists throughout the winter.

PREFERRED HABITAT.—Deep, rich, moist mountain soil.

RANGE.—Rhode Island to Michigan, and Missouri and south to Florida and Arkansas.

THE Tulip Tree is one of the most stately and magnificent trees of the forests of eastern North America. It grows to a great size, and frequently reaches a height of 80 to 120 feet, and attains a diameter of six to eight feet. One specimen was found in western North Carolina which was sixteen feet thick. Many of these large trees are 300 to 350 years old.

The Tulip Tree can readily be recognized by its straight and clean trunk, with a very deep-furrowed bark and its characteristic broad, slightly lobed, and blunt-pointed mass of leaves. The leaves appear to have their apexes cut off at right angles to the midrib. The leaf appendages which occur at the base of the leaves encircle the twigs, and upon falling off leave distinctive linear scars which encircle the twigs.

This tree probably has the most interesting and unique buds of any American forest tree. They comprise a series of leaf-like scales, each of which incloses a miniature leaf. In spring and early summer the tulip-like flowers, and in fall and winter the erect cone-like fruit, are also distinctive.

The Tulip Tree yields a wood which ranks with the world-famous White Pine. It is soft, whitish to yellowish, handsome in color, polishes nicely, and does not warp or shrink badly. It is odorless, tasteless, and used extensively for candy and cigar boxes, tobacco hogsheads, and kitchen and pantry utensils.

THE LAUREL FAMILY

LAURACEÆ

THE Laurel Family comprises about forty different groups of plants which embrace about 1,000 different species. Most of the members of this family are found in the tropics. Only two representatives are found north of the Mason and Dixon line, viz.: the Sassafras and Spice Bush [*Benzoin æstivale* (L.) Ness.].

At one time, the medicinal properties of the Sassafras Bush were held in high regard; but its virtues are now considered to belong more truly to the commercial arts. It is used extensively as a flavoring for candy, and in the preparation of a "tea," much esteemed by many persons. The wood, bark, and roots yield the essential oil which is the basis of the "flavor."

SASSAFRAS

SASSAFRAS VARIFOLIUM *Kuntze*

FAMILY.—Laurel.

OTHER NAMES.–Sassafras; Saxifrax Tree; Saxifrac.

GENERAL DESCRIPTION.—*Shape:* crown flat-topped or round, and dense; trunk stout and short *Height:* 40 to 50, sometimes 100 feet, with a diameter of 3 to 4 feet. *Bark:* on old trunks reddish-brown, deeply fissured, and flat-ridged; on twigs green, smooth, aromatic, and mucilaginous. *Buds:* alternate, ovate, 2/5 of an inch long, covered with 2 or 3 green, slightly heavy scales. *Leaves:* alternate simple, ovate, 4 to 6 inches long, entire or 2 to 5 lobed. *Leaf-scars:* small, raised, with a single bundle-scar. *Flowers:* appear about May, greenish-yellow, and arranged in loose drooping cluster. *Fruit:* a dark-blue, glossy berry, borne on a bright red and stout stem.

PREFERRED HABITAT.—Rich, sandy soil. Common along fence rows and in abandoned fields.

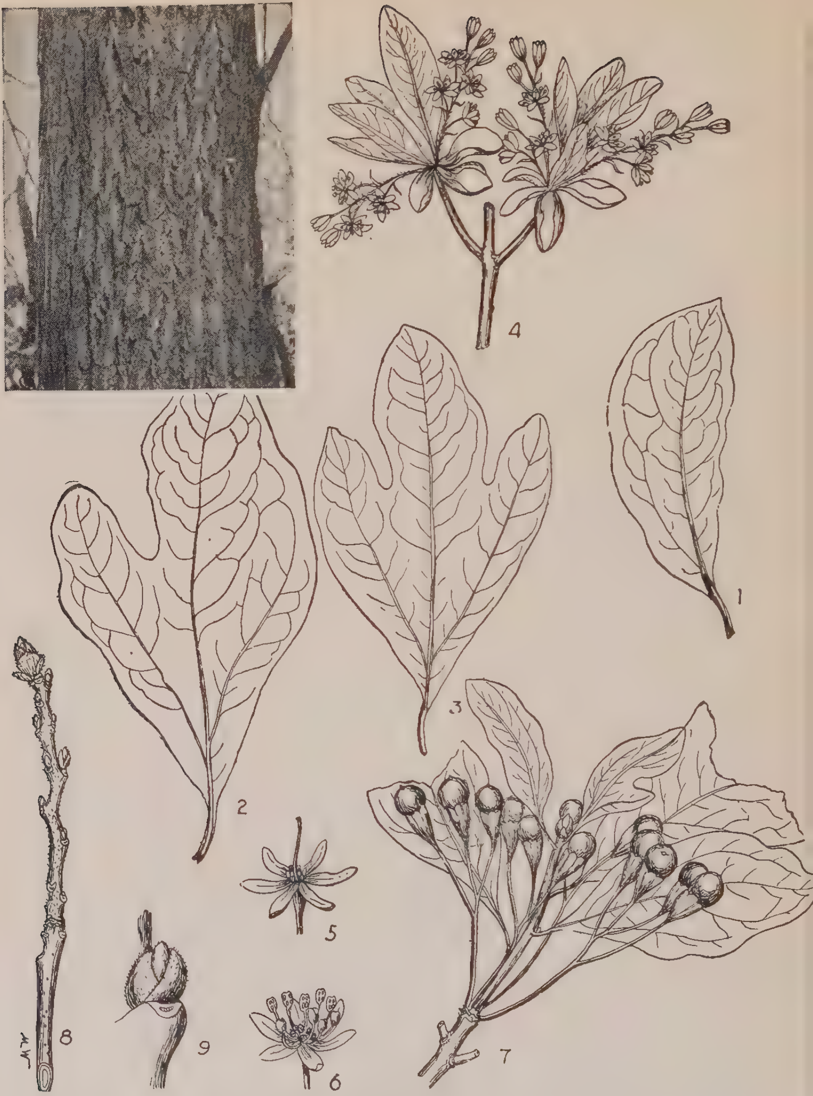
RANGE.—Massachusetts to Michigan and Kansas, and south to Florida and Texas.

THE Sassafras, the sole representative of this genus in the United States, was one of the first American trees which became widely known in Europe. The Indians told the early settlers about its medicinal properties. Roots of Sassafras comprised a part of the first cargo ever exported from Massachusetts.

The distinctive aromatic taste of the bark, roots, and wood, and the accompanying pleasant odor, are positive means of identification. If one breaks off a brittle twig of green-barked Sassafras, a pleasant aromatic odor is emitted immediately; and upon chewing it, the flavor of the mucilaginous inner bark is found to be very delicious.

The leaves take on three distinctive forms, as if to help make the tree conspicuous, and have it stand out from all other trees. They are all simple in form and alternate in their arrangement. The oval entire-margined form is commonest. In the mitten form the leaf has one large thumb-like projection, which may be either on the right or left side. Sometimes the leaves are prominently three-lobed, and occasionally five-lobed.

The fruit is a dark-blue berry, which is borne on bright red and club-like fleshy stems, and arranged in rather open clusters. It furnishes excellent food for birds.



SASSAFRAS

1 = An ovate, entire leaf; 2 = a glove-form leaf; 3 = a three-lobed leaf; 4 = a flowering branch with immature leaves; 5 = a fertile flower, enlarged; 6 = a sterile flower, enlarged; 7 = a fruiting branch; 8 = a winter twig; 9 = section of a winter twig

Sassafras yields ordinary wood, which resembles Chestnut closely, and is often substituted for it on the market.

Fortunately, there need exist no fear of the tree becoming extinct, for birds carry the seeds to every fence corner, and scatter them over abandoned pasture-land in large numbers.

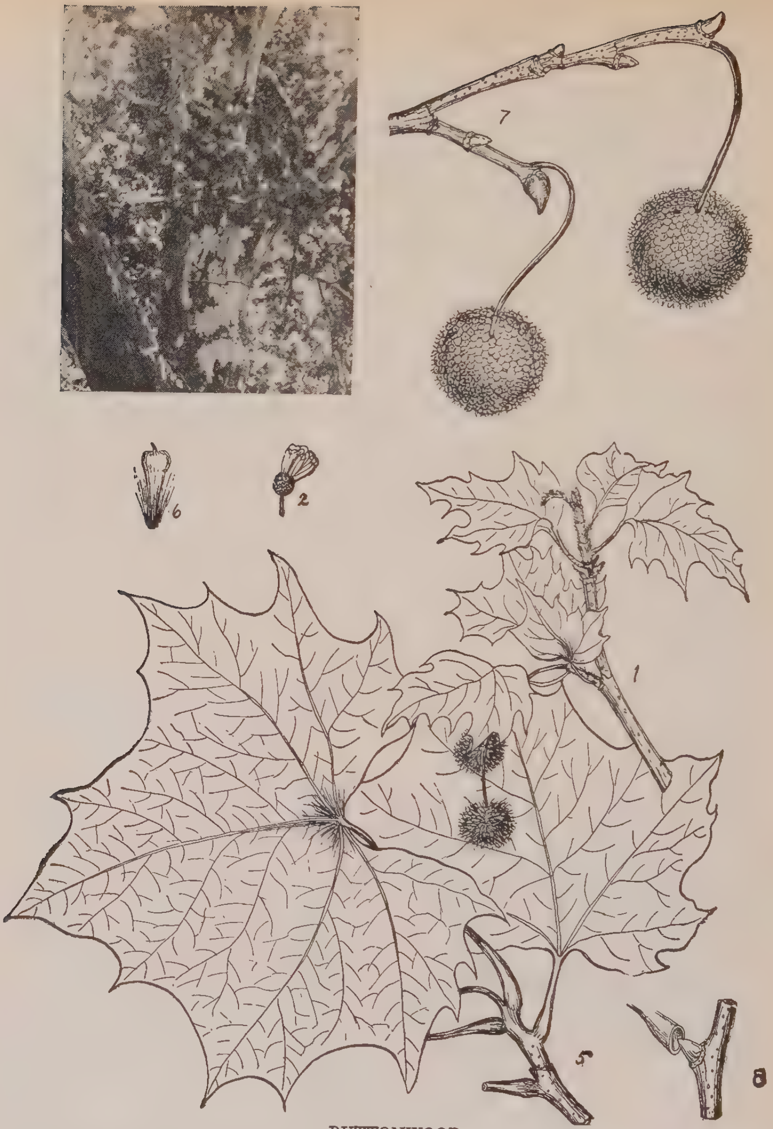
THE PLANE TREE FAMILY

PLATANACEÆ

THERE are only six representatives of the Plane Tree Family found in the world. Three of them are in the Old World, and three are native to the New World. They all attain tree size, and belong to a single genus, known scientifically as *Platanus*, which means broad, and refers to the width of the leaves.

Two representatives of this family are well known and distributed widely in the United States, viz.: the Oriental Plane Tree and our native Plane Tree, also known as Sycamore and Buttonwood.

The Oriental Plane Tree possesses all the characteristics desirable of a shade tree. It grows rapidly, is hardy, forms beautiful crown, gives ample shade, has an attractive bark, and is not troubled with insect pests. It has so many merits that it is being planted in some places almost to the exclusion of any other tree. In Washington and Philadelphia a large number have been set out; and in Paris a large percentage—probably more than one-third—of the city trees are Oriental Planes.



BUTTONWOOD

1 = A flowering branch; 2 = a head of flowers with most of the flowers removed; 5 = a fruiting branch with mature leaves; 6 = an achene, enlarged; 7 = a winter twig with two heads of fruit; 8 = section of a twig showing a subpetiolar bud

BUTTONWOOD

PLATANUS OCCIDENTALIS *Linnæus*

FAMILY.—Plane Tree.

OTHER NAMES.—Buttonball; Sycamore; American Plane Tree.

GENERAL DESCRIPTION.—*Shape:* trunk short and stout; crown deep, wide-spreading, rather open, with interwoven branches. *Height:* 70 to 100, sometimes 170 feet, with a diameter of 4 to 10 feet. *Bark:* on twigs greenish to brown and hairy, marked with white dots; on young trunks peels off in irregular plates exposing a whitish, yellowish, or greenish inner bark; on old trunks thick, rigid, peels off in dark-brown scales. *Buds:* conical, very divergent from branches, covered with 3 reddish-brown scales, and completely surrounded with leaf-scars. *Leaves:* alternate, simple, broadly ovate, 4 to 10 inches across, toothed on margin, pale woolly on lower surface; base of leaf-stalk is enlarged and hollow. *Leaf-scars:* encircle the buds completely, unequal in width, have a wavy margin, contain 5 to 10 bundle-scars. *Flowers:* appear with the leaves in May in dense heads. *Fruit:* a brown ball 1 to 2 inches in diameter, and suspended from a slender stalk.

PREFERRED HABITAT.—Moist, fertile soil, but will grow in dry situations.

RANGE.—Maine and Ontario, west to Minnesota, and south to Florida and Texas.

OUR native Buttonwood, or Sycamore, is the most massive tree in the eastern United States. It may reach a height of over 150 feet, and occasionally exceeds ten feet in diameter. It has an exceptional crown, which is high, wide-spreading, and composed of many tortuous branches. The bark is so unusual, that it will never be forgotten if seen but once. It consists of a crazy patchwork of white, green, yellow, gray, and brown. In winter, white is the predominating color.

One of the delights of the country boy is to ask his friend to find the buds of the Buttonwood tree. At the first glance no buds appear to be at hand. A closer examination of a twig will reveal that the buds are hidden completely under the enlarged stalks of the leaves. Hence, the buds are described as *sub-petiolar*, which means under the petiole of the leaf.

The large leaves, head-like clusters of flowers, and the ball-like fruit which often persists far into winter, are very helpful distinguishing characteristics. In winter the smooth, reddish-brown pointed buds, surrounded completely with a leaf-scar, and covered with a single exposed bud-scale, will prevent one from confusing it with any other tree.

The wood of this tree is annually becoming of more commercial importance. It weighs about thirty-six pounds per cubic foot, and is used for crates, tobacco boxes, novelty wares, furniture, interior finishings, and other similar uses.

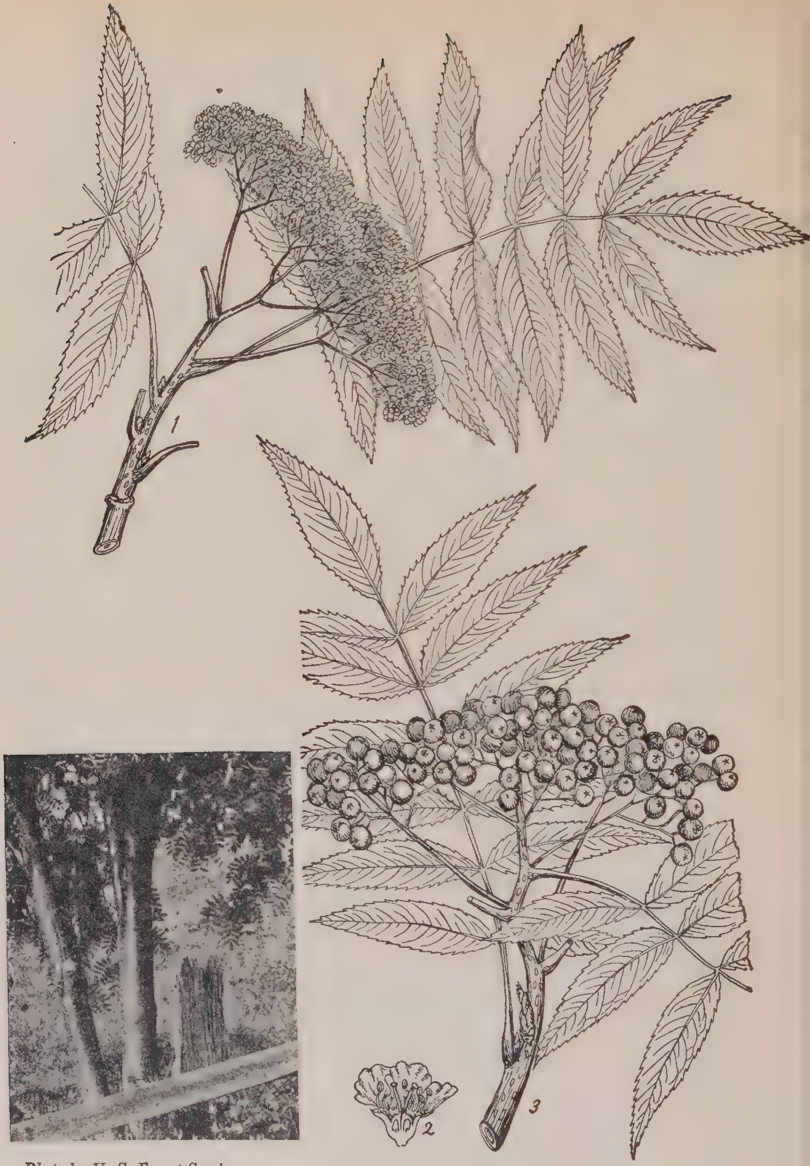


Photo by U. S. Forest Service

MOUNTAIN ASH

1 = A flowering branch with leaves; 2 = longitudinal section of a flower, enlarged; 3 = a fruiting branch

THE ROSE FAMILY

ROSACEÆ

THE Rose Family comprises more than one hundred different groups of plants, with a total membership of over 1,500 distinct species. Its representatives comprise trees, shrubs, and herbs. Among them are some of our common plants of the gardens and orchard trees. The Strawberries, Raspberries, Blackberries, and Dewberries are among its members. A few of the trees belonging to it are important on account of the timber which they produce, but most of them are prized for their fruit. The following groups of trees are among its well-known members:

Common Name	Scientific Name
1. The Plums, Cherries, and Peaches.	Prunus.
2. The Apples, Pears, and Mountain Ash.	Pyrus.
3. The Hawthorns.	Cratægus.
4. The Juneberries.	Amelanchier.

MOUNTAIN ASH

PYRUS AMERICANA *De Candolle*

FAMILY.—Rose.

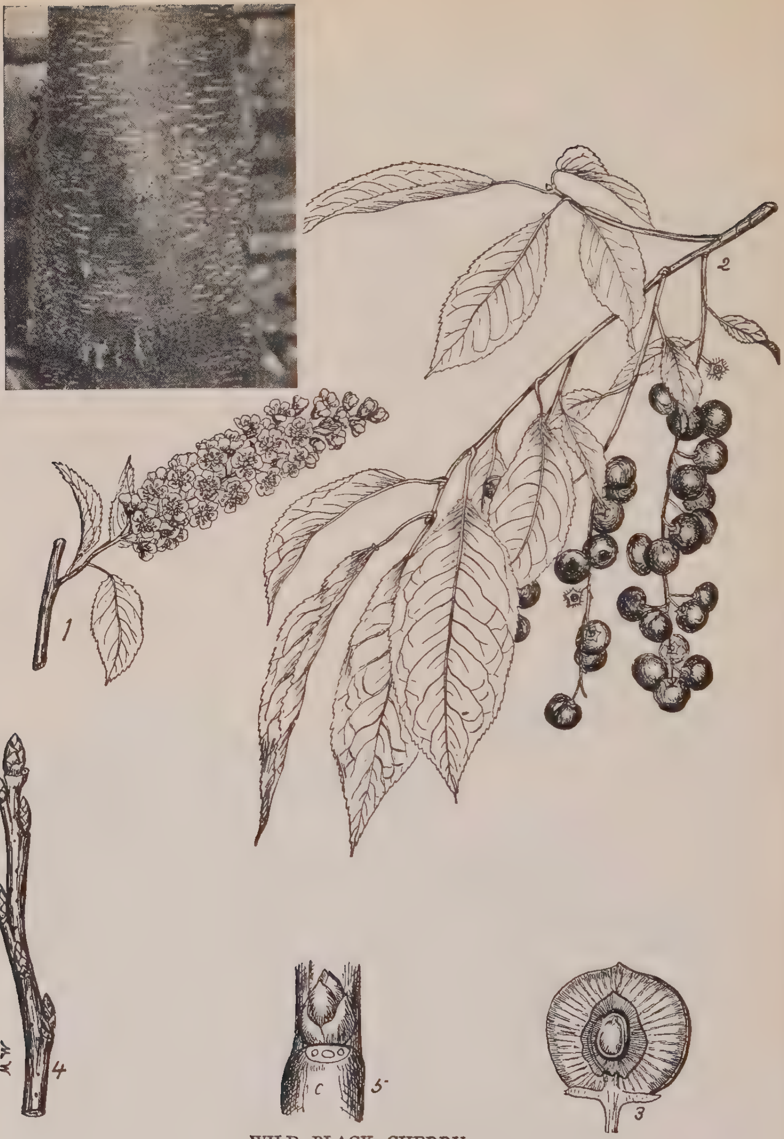
OTHER NAME.—American Mountain Ash.

GENERAL DESCRIPTION.—*Shape:* medium-sized tree with narrow, round-topped crown. *Height:* 20 to 30, sometimes 50 feet. *Bark:* thin, grayish, smooth or scaly. *Buds:* purplish-red, slightly hairy, conical, sharp-pointed, sometimes ½ of an inch long. *Leaves:* alternate, compound, 6 to 10 inches long, with 13 to 17 sessile leaflets. *Leaf-scars:* rather large, U-shaped, contain 3 to 5 bundle-scars. *Flowers:* white, arranged in flat clusters measuring 3 to 4 inches across, and appear about May. *Fruit:* a bright red berry arranged in flat-topped clusters; matures about September.

PREFERRED HABITAT.—Wet places and rocky hillsides.

RANGE.—Newfoundland to Manitoba and Iowa, southward along mountain to North Carolina.

THE American Mountain Ash is a distinctly northern tree. It seems to thrive best in cold swamps and northern slopes. In 1918 I spent two days



WILD BLACK CHERRY

1 = Section of a flowering branch; 2 = a fruiting branch; 3 = section of a fruit, enlarged; **4** = a winter twig, natural size; 5 = section of a winter twig, enlarged in exploring the Bears Meadows, located in Center County, Pennsylvania, which aggregate about 600 acres, and form an almost impenetrable swamp. The Mountain Ash was the commonest tree within the area, and was associated with the Black Spruce, Balsam Fir, Sundew, Pitcher Plant, and Sphagnum moss.

It frequently reaches a height of twenty-five feet, with a diameter of one foot, and may be distinguished by its alternate compound leaves with thirteen to seventeen stalkless leaflets, which are sharply toothed along the margin, and by its white flowers and bright red fruit arranged in flat-topped clusters about three to four inches wide. In winter the stout grayish to reddish-brown twigs marked with pale lenticels and bearing purplish-red, sharp-pointed, somewhat gummy, buds are helpful distinguishing characteristics.

The Mountain Ash produces no wood of commercial value. It is, however, being planted as an ornamental tree on account of its attractive white flowers and beautiful red fruit, but is set out less extensively than the European Mountain Ash, so common in our parks and gardens.

Wild Black Cherry

Prunus serotina *Ehrhart*

Family.—Rose.

Other Names.—Wild Cherry; Rum Cherry; Black Cherry; Cabinet Cherry.

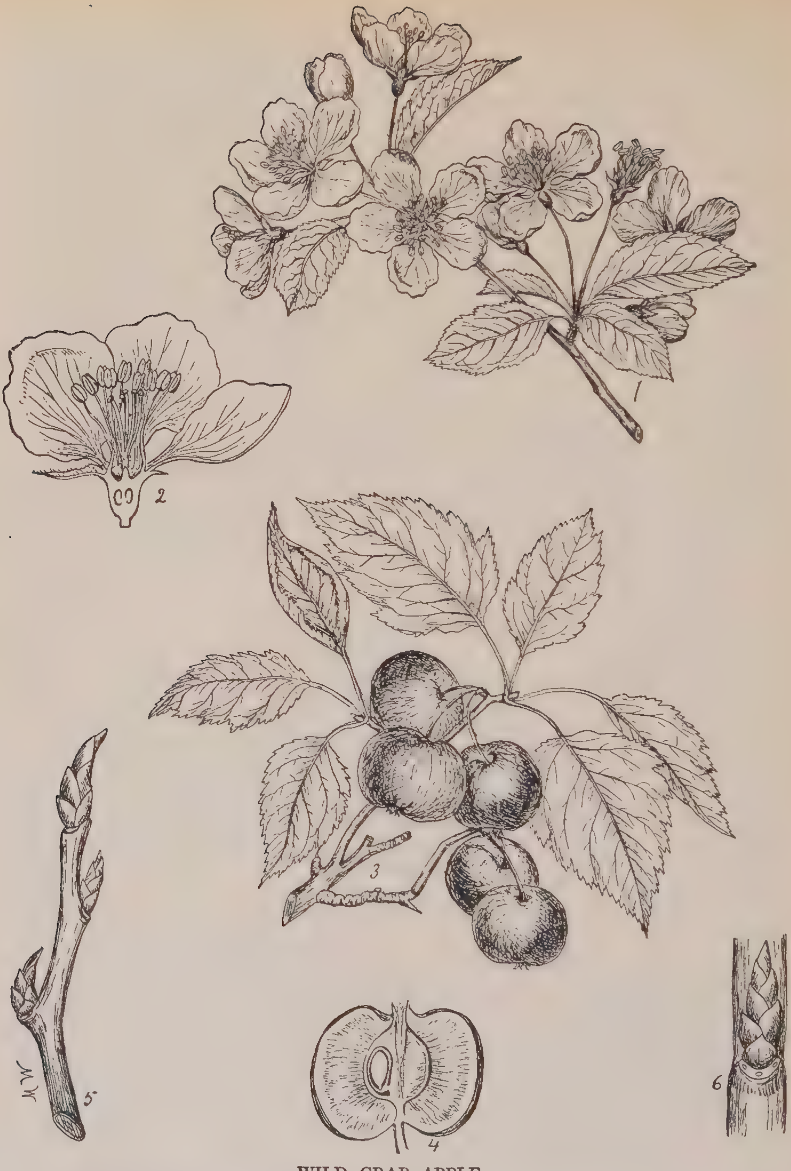
General Description.—*Shape:* from narrow oblong to rounded. *Height:* 50 to 75, sometimes 110 feet. *Bark:* on twigs reddish-brown marked with numerous white lenticels; on young trunks smooth, glossy, reddish-brown, dotted with horizontally elongated lenticels (breathing pores); on old trunks black, rough, and scaly. *Buds:* smooth, glossy, about ¼ of an inch long, covered with reddish-brown scales, often coated with a white film. *Leaves:* alternate, simple, oblong, 2 to 5 inches long, sharp-pointed, finely-toothed on margin, glossy, deep green. *Flowers:* white, borne in narrow drooping clusters 3 to 4 inches long, and appear during May and June. *Fruit:* a purplish-black, juicy, bitter drupe, arranged in drooping clusters.

Preferred Habitat.—Rich, fertile bottom-lands and slopes.

Range.—Nova Scotia to South Dakota, south to Florida and Texas.

The Wild Black Cherry is the only native species of Cherry which attains the size of a large tree. The other common native species rarely exceed a height of forty feet and a diameter of ten inches. It may be distinguished at all seasons of the year by its bark. On old trunks it is rough, scaly, and almost black in color, while on young trunks it is rich reddish-brown in color, and marked clearly with horizontally elongated short white lines. The inner bark has a characteristic bitter taste and prominent odor, due to the presence of hydrocyanic acid.

When in bloom the tree may be recognized by its white flowers, which are arranged in drooping conical spikes. Its leaves are narrowly egg-



WILD CRAB APPLE

1 = A flowering branch; 2 = longitudinal section of a flower enlarged; 3 = a fruiting branch; 4 = section of a fruit, natural size; 5 = a winter twig, natural size; 6 = winter twig enlarged

shaped, long-pointed, and sharp-toothed. Its fruit is a drupe about the size of a large pea, containing a small stone surrounded by a dark-purple flesh covered by a shiny black skin. The fruits are arranged in loose drooping spike-like clusters, and are slightly bitter.

The Wild Black Cherry is one of the most important hardwood timber-trees in the eastern United States. It supplies the cherry wood of commerce. The wood is hard, strong, fine-grained, polishes well, does not warp or split, and is reddish-brown in color. It weighs about thirty-seven pounds per cubic foot, and is used principally for furniture and finish.

American Crab Apple

PYRUS CORONARIA *Linnæus*

FAMILY.—Rose.

OTHER NAMES.—Wild Crab Apple; American Crab; Crab; Wild Crab; Fragrant Crab.

GENERAL DESCRIPTION.—*Shape:* crown broad and round-topped, consisting of slender, spreading, crooked branches; trunk short and furrowed. *Height:* up to 25 feet with a diameter of 14 inches. *Bark:* reddish-brown, scaly, furrowed. *Buds:* bright red, blunt-pointed, 1/8 to ¼ of an inch long, covered with 4 to 8 visible scales. *Leaves:* alternate, simple, ovate, 3 to 4 inches long. *Flowers:* appear in May or June; fragrant, rosy-white, 1½ to 2 inches across, arranged in small clusters. *Fruit:* a small, yellowish-green apple, 1 to 1½ inch in diameter, ripens about October.

PREFERRED HABITAT.—Rich, moist soil in thickets and open woods.

RANGE.—Ontario to South Carolina and Alabama, west to Michigan, Missouri, and northern Louisiana.

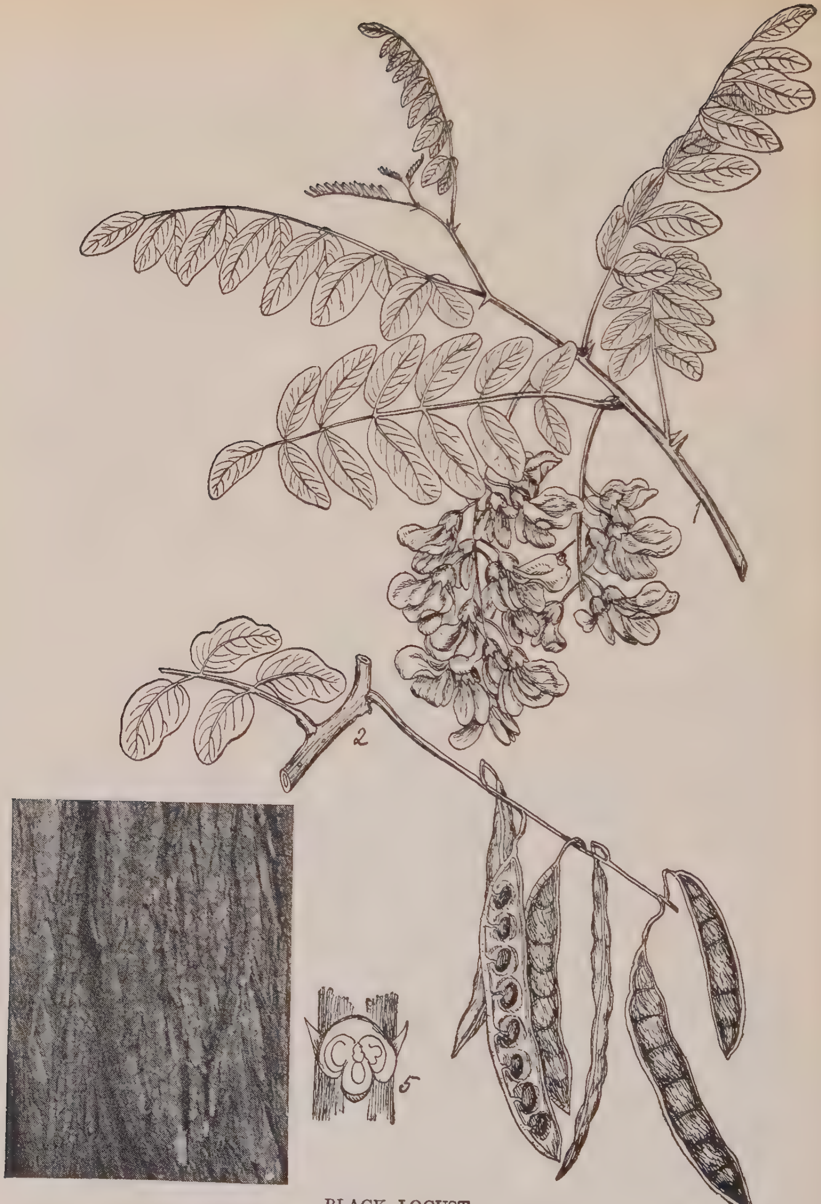
IT is often said that the early pioneer was sure to have an apple-tree in his lawn and a dog by his side. Quite often the apple-tree in his lawn was the Wild Crab Apple.

The Wild Apple of America, generally known as Wild Crab, has many striking distinguishing characteristics. Some people plant this tree in their lawns on account of the beautiful color and fine smell of its flowers. The greatest charm of this tree lies in its fragrant blossoms, which resemble those of the domestic apple, but are somewhat deeper tinted with red and also more fragrant.

This tree rarely exceeds 20 feet in height and has a crown made up of rigid contorted branches, which are a helpful means of identification.

Its fruit is a small, yellowish-green apple. It ripens about October, but may hang on the tree far into winter. If they remain on the ground under the tree during the winter they acquire a yellow color, but do not lose their bitter taste. They seldom rot before spring, and so far no use has been found for them except in the making of jellies and cider.

Peter Kalm, who was one of the twelve men whom the great naturalist Linnaeus called his apostles, wrote that "the crab-tree is very plentiful in Pennsylvania, where it grows in woods and glades and produces flowers with a very pleasant smell, somewhat like the raspberry."



BLACK LOCUST

1 = A flowering branch; 2 = a fruiting branch; 5 = section of a winter twig, enlarged

THE PULSE FAMILY

LEGUMINOSÆ

THE Pulse Family comprises 460 different groups of well-known trees, shrubs, and herbs, with a total membership of more than 7,000 distinct species.

Many of our common domestic and foreign plants belong to this family. Some of our valuable food plants, such as the peas, beans, clover, and peanuts, are among its representatives.

Numerous important commercial products are derived from some of its members. Senna, which is extensively used on account of its laxative properties, is derived from the leaves of a few species of Cassia native to Africa. Logwood, regarded as the most valuable of the vegetable dyes, is procured from the heartwood of a tree native to the West Indies. Indigo is also derived from a member of this family.

Probably the most interesting of all its members is the Sensitive Plant, which is cultivated extensively in our greenhouses and used widely in plant experimentation work.

The Pulse family has some important timber trees among its representatives. The following four groups have representatives which are famed for their ornamental qualities and valuable wood:

Common Name	Scientific Name
1. The Locusts.	Robinia.
2. The Honey Locusts	Gleditsia.
3. The Redbuds.	Cercis.
4. The Coffee Trees.	Gymnocladus.

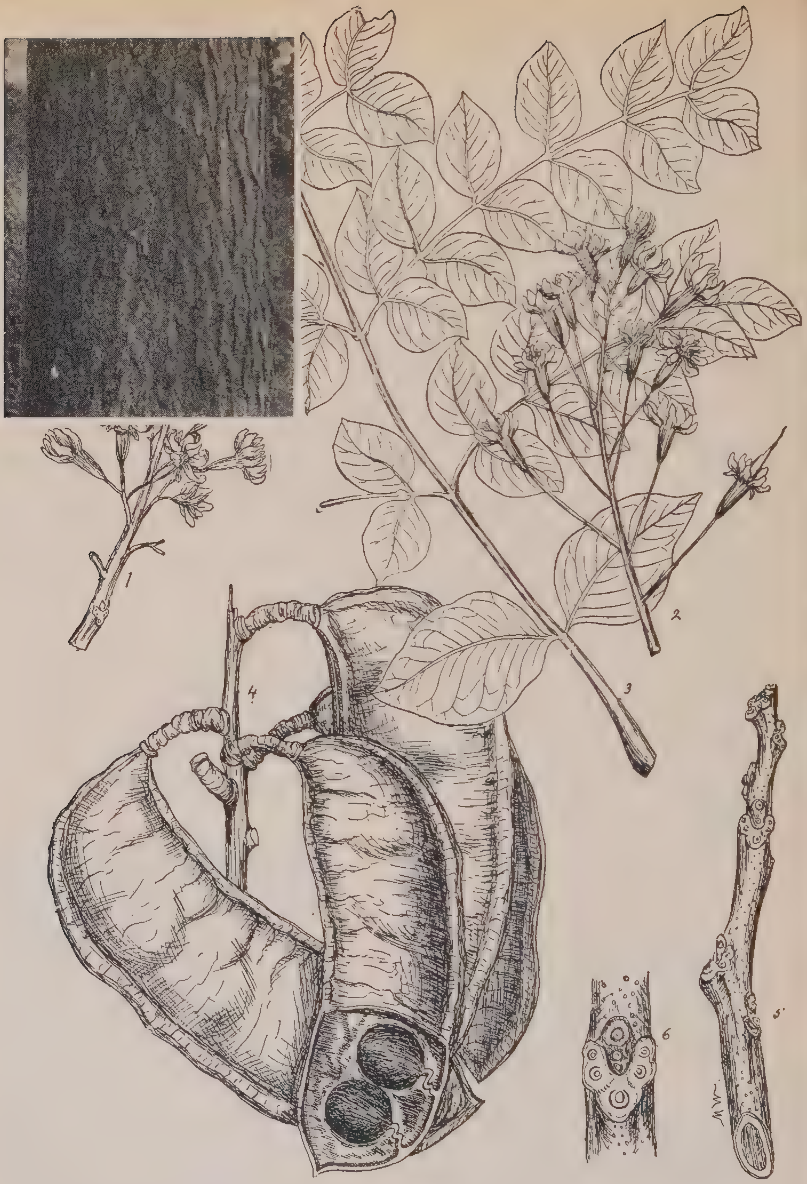
Black Locust

ROBINIA PSEUDO-ACACIA *Linnæus*

FAMILY.—Pulse.

OTHER NAMES.—Common Locust; Yellow Locust; White Locust; Locust, Acacia.

GENERAL DESCRIPTION.—*Shape:* narrow and oblong. *Height:* 40 to 50, sometimes 75 feet. *Bark:* reddish-brown, on old trunks rough and deeply furrowed, on young



KENTUCKY COFFEE TREE

1 = Staminate flowers; 2 = pistillate flowers; 3 = portion of a doubly compound leaf; 4 = fruit pods with a portion of one pod removed showing two seeds; 5 = section of a winter twig showing superposed and inconspicuous buds, lenticels, pith, and leaf-scars with bundle-scars; 6 = section of a winter twig, slightly enlarged

trunks greenish to brown; twigs bear two spines at nodes. *Pith:* white and angular in cross section. *Buds:* small, inconspicuous, imbedded in twig, often 3 to 4 above each other. *Leaves:* alternate, compound, 8 to 14 inches long, with an odd number of leaflets. *Leaf-scars:* large, conspicuous, irregular in outline, contain 3 bundle-scars. *Flowers:* resemble sweet pea, cream-white, fragrant, appear about May, and are arranged in drooping clusters about 5 inches long. *Fruit:* a small, thin, dark-brown pod about 4 inches long and ½ of an inch wide, containing 4 to 8 dark-brown mottled seeds.

PREFERRED HABITAT.—Grows on almost any kind of soil, but does not endure dense shade.

RANGE.—Mountains of Pennsylvania to Iowa, south to Georgia and Kansas.

AT all seasons of the year the Black Locust may be identified by deeply furrowed dark-brown bark on the old trunks, the greenish to reddish-brown brittle twigs armed with two short spines at each node, and the yellowish-brown heartwood, which begins to form as early as the fourth or fifth year of the tree's life.

The compound leaves, with seven to nine leaflets, are a reliable means of identification. Each leaf is from eight to fourteen inches long, and bears an odd number of leaflets. The leaflets are egg-shaped in outline, about one inch long, and turn brownish-yellow in autumn.

The flowers are cream-white in color, resemble the blossoms of a pea, and are arranged in drooping clusters. The fruit consists of a dark-brown thin pod, about three inches long and one-half of an inch wide. Each pod contains from four to eight small dark-brown mottled seeds.

The wood is heavy, hard, strong, durable, and yellowish to brownish in color. It weighs about forty-six pounds per cubic foot and is in great demand for special uses. It has no superior for fence posts and for fuel-wood. Most of the insulator pins, used by the millions on telephone and telegraph poles, are made of locust wood. During the recent war much locust wood was used in the manufacture of tree nails employed in the construction of wooden ships.

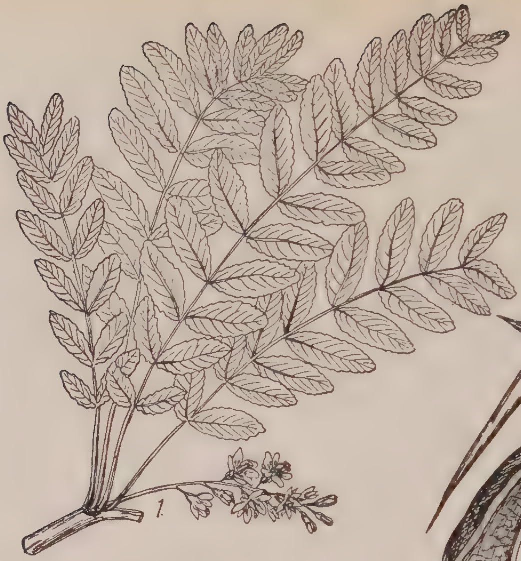
KENTUCKY COFFEE TREE

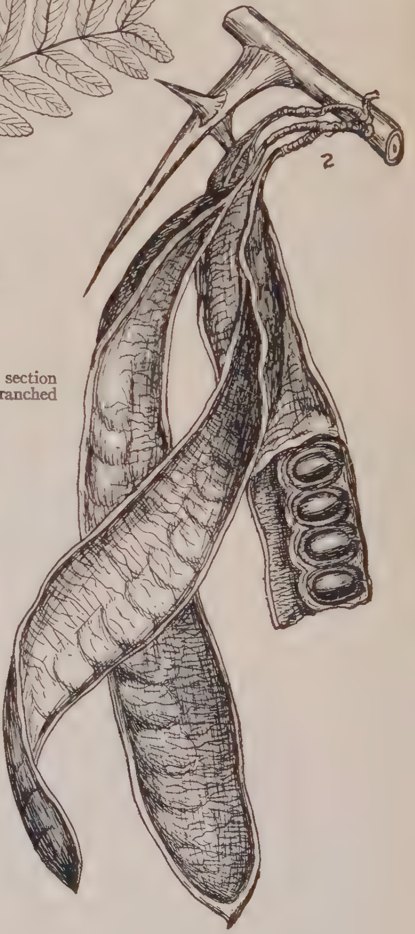
GYMNOCLADUS DIOICA (*L.*) *Koch*

FAMILY.—Pulse.

OTHER NAMES.—Mahogany; Coffee Nut; Nigger Tree.

GENERAL DESCRIPTION.—*Shape:* crown narrow, high, composed of few stout branches. *Height:* 40 to 80, sometimes 100 feet. *Bark:* dark gray to brown, rather rough, covered with shallow furrows; on twigs greenish-brown and covered with a whitish scaly film. *Pith:* wide, pink to brown in color. *Buds:* small, downy, imbedded in twigs, occur above one another. *Leaves:* alternate, very large, 1 to 3 feet long, 1 to 2 feet wide, twice compound. *Leaf-scars:* broadly U-shaped, pale in color, contain 3 to 5 bundle-scars. *Flowers:* greenish-white, appear about June in large spikes 6 to 8 inches long. *Fruit:* a broad,





HONEY LOCUST

1 = Flowering branch with mature leaves; 2 = section of a branch with fruiting pods and a branched thorn

flat, stubby, leathery, reddish-brown pod 4 to 10 inches long and containing 6 to 9 hard dark-brown seeds.

PREFERRED HABITAT.—Rich bottom-lands and along moist foothills.

RANGE.—Central New York to Minnesota, south to Tennessee and Oklahoma.

THE Kentucky Coffee Tree seems to be a comparatively rare tree throughout its entire range. It attracts attention wherever it grows on account of its unusual features.

The trunk is short, and soon divides into two to four secondary stems. The dark-gray to dark-brown bark is of medium thickness, and roughened by very sharp and firm projecting ridges. The reddish inner bark is often visible at the base of the bark furrows.

The twigs are stout, clumsy, without thorns, and greenish-brown. They are often coated with a whitish crusty film, and occasionally with fine hairs, and marked with large heart-shaped leaf-scars.

The pith is large, round, and pinkish to reddish-brown. The buds are all lateral, no terminal buds being present. They are small, covered with minute hairs, almost entirely imbedded in the twig, and placed above one another. The uppermost bud is usually the largest. The lower buds are smaller, less evident, and located within the depression on the upper margin of the leaf-scar.

The leaves are twice compound, one to three feet long and up to two feet broad. The ovate and entire-margined leaflets are very distinctive. They occur on lateral stalks, except the lower pair, or occasionally two pairs.

The thick, stubby, woody, and persistent fruit-pods with their large dark-brown seeds cannot be confused with those of any other native or introduced tree. The large terminal racemes or raceme-like corymbs of regular and greenish-white flowers, which appear about June, are also distinctive.

The Kentucky Coffee Tree is planted locally as an ornamental tree. It has no special merits other than its unusual appearance and striking characteristics.

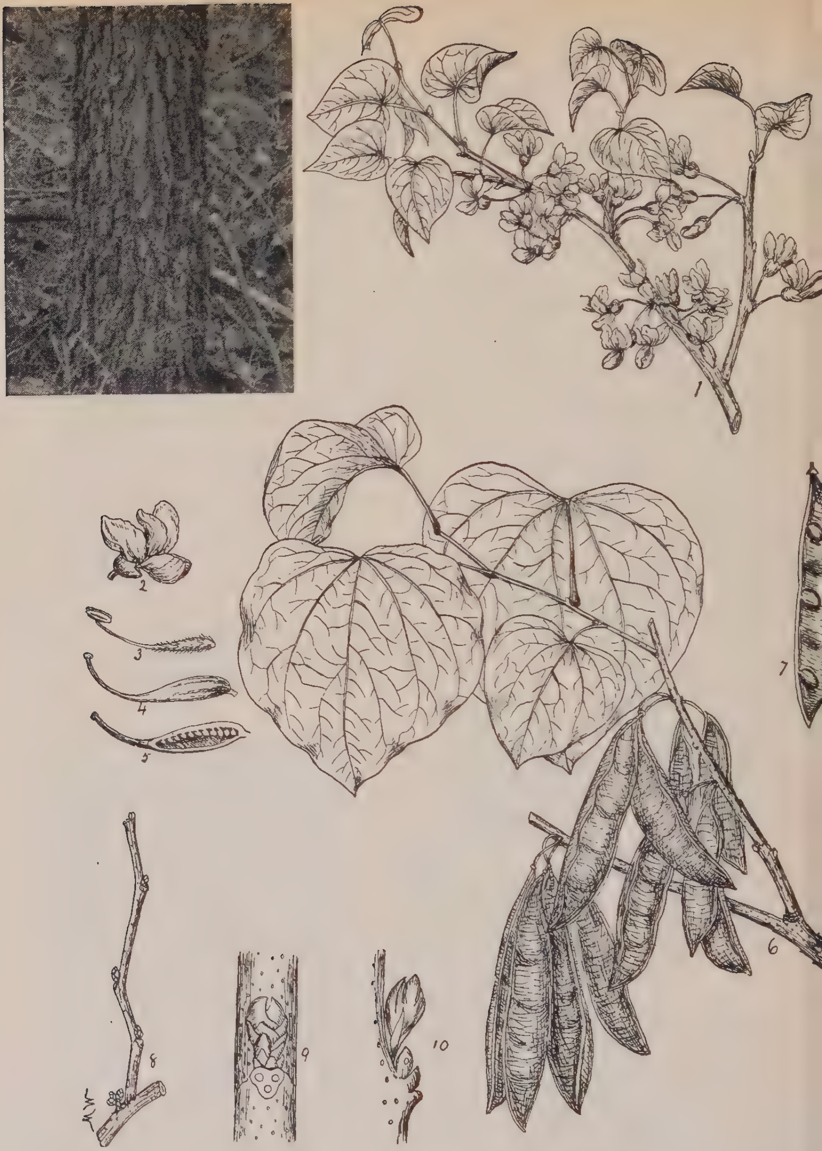
HONEY LOCUST

GLEDITSIA TRIACANTHOS *Linnæus*

FAMILY.—Pulse.

OTHER NAMES.—Sweet Locust; Thorn Tree; Three-thorned Acacia; Honey Shucks.

GENERAL DESCRIPTION.—*Shape:* broad and round-topped. *Height:* 60 to 80, sometimes 140 feet. *Bark:* on old trunks grayish-brown to black, roughened by shallow furrows; on young trunks smooth, reddish-brown, covered with pale dots, and bears numerous three-pronged thorns. *Buds:* small, inconspicuous, brownish, 3 to 5 at a node. *Leaves:* alternate, once or twice compound, 7 to 8 inches long, bearing an even number of leaflets. *Flowers:* greenish, appear in May and June; pollen-bearing are arranged in short spikes,



REDBUD

1 = A flowering branch; 2 = a single flower; 3 = a single stamen, enlarged; 4 = a single pistil, enlarged; 5 = a pistil with the ovary sectioned so as to show the ovules, enlarged; 6 = a fruiting branch; 7 = an opened pod, showing the seeds; 8 = a winter twig; 9 = section of the winter twig, enlarged; 10 = portion of a winter twig, showing arrangement of buds and seed-bearing in small clusters. *Fruit:* a flat, thin reddish-brown pod about 10 to 18 inches long, containing many small, flat, brownish seeds.

PREFERRED HABITAT.—Rich, fertile soil. Common in bottom-lands and along streams.

RANGE.—Ontario to Kansas, south through Pennsylvania to Florida and Texas.

THE Honey Locust is a tree which so much resembles the Black Locust in its fruit, wood, and leaves that one does not wonder that it is called a Locust.

The surest means of identification is the formidable thorns found upon the main trunk and the larger branches. These unusual thorns are often four to six inches long and usually three-pronged. They may occur solitary or in dense clusters.

Throughout the summer the once-compound or sometimes twice-compound leaves with an even number of leaflets are distinctive, and during autumn and winter the thin leathery brown fruit-pods, which sometimes reach a length of eighteen inches, cannot be confused with the fruit of any other tree. Each pod contains about twenty chocolate-brown seeds.

The grayish-brown to black bark on old trunks roughened by shallow furrows separating hard projecting ridges and the numerous and conspicuous oblong and brown dots (lenticels) on the branches are positive distinguishing characteristics.

The buds are by no means the least distinctive organs of the tree. If one cuts a twig lengthwise and examines the cut surface carefully the buds may be observed. As a rule, five separate buds occur above each other, the upper ones being scaly and barely visible, while the lower ones are not scaly and entirely hidden beneath the bark. No other of our common trees has such a bud arrangement.

The Honey Locust is hardy, easily propagated, grows rapidly, produces valuable wood, and has few enemies.

REDBUD

CERCIS CANADENSIS *Linnæus*

FAMILY.—Pulse.

OTHER NAME.—Judas Tree.

GENERAL DESCRIPTION.—*Shape:* a small tree with short trunk and broad crown. *Height:* 15 to 25, sometimes 50 feet. *Bark:* reddish brown, scaly. *Buds:* small, 1/8 of an inch long, blunt-pointed, often occur above each other, covered with purplish red scales. *Leaves:* alternate, simple, heart-shaped, 3 to 5 inches long. *Flowers:* resemble the sweet pea, appear in early spring before the leaves, 4 to 8 in a cluster. *Fruit;* a small, light-brown, short-stalked pod, 2 to 3 inches long, ½ of an inch wide.

Preferred Habitat.—Rich and fertile lowland soil and moist hillsides. Common in abandoned fields, cut-over land, and burnt-over areas.

Range.—Ontario to Minnesota, south through New Jersey to Florida, and west to Arkansas.

When a large shrub or small tree is desired for ornamental planting, no more desirable one can be found than the Redbud. It is common in the woodlands as far north as Pennsylvania, and occurs locally farther northward.

No native tree has more striking features than this species possesses. Its simple, heart-shaped leaves are truly distinctive. Its flowers are pinkish in color, resemble the sweet pea in outline, and appear before the leaves in clusters of four to eight. Sometimes this tree forms thickets, and the flowers are produced in such large numbers that an entire hillside appears like an unbroken sea of blossoms. When in full bloom it is the most conspicuous feature of the landscape. Not even the Flowering Dogwood, or Shad Bush, challenges it to divide honors.

The flowers are succeeded by small fruit-pods which show their family relationship. The pods are thin, two to three inches long, one-half of an inch wide, and light brown to deep rose in color. They occur in dense clusters, and often persist into winter.

A careful examination of the light-brown winter twigs will show very impressively the source of the common name Redbud. The numerous buds are truly purplish-red in color. Some of them occur singly along the twigs, while many of them are placed in a vertical row above the leaf-scars, and rather frequently a cluster of three or more buds may be found in the axils below the origin of the lateral branches. No other native tree develops its buds in such an unusual place.

THE SUMACH FAMILY

ANACARDIACEÆ

THE Sumachs comprise a large number of trees and shrubs. About 120 different kinds are known, but most of them are found in South Africa, only sixteen species being native to North America.

The Common Poison Ivy (*Rhus toxicodendron*, L.) and the Poison Sumach (*Rhus vernix*, L.) are members of this group of plants. Both species are very poisonous. The former may be recognized by its smooth twig, compound leaves with three leaflets, and white berry-like fruit, and the latter may be distinguished by its smooth and rather stout twigs bearing a terminal bud, compound leaves with seven to thirteen shiny leaflets, and white berry-like fruit arranged in drooping clusters. The non-poisonous Sumachs have erect red fruit, while the poisonous have drooping white fruit.

STAGHORN SUMACH

RHUS TYPHINA *Linnæus*

FAMILY.—Cashew.

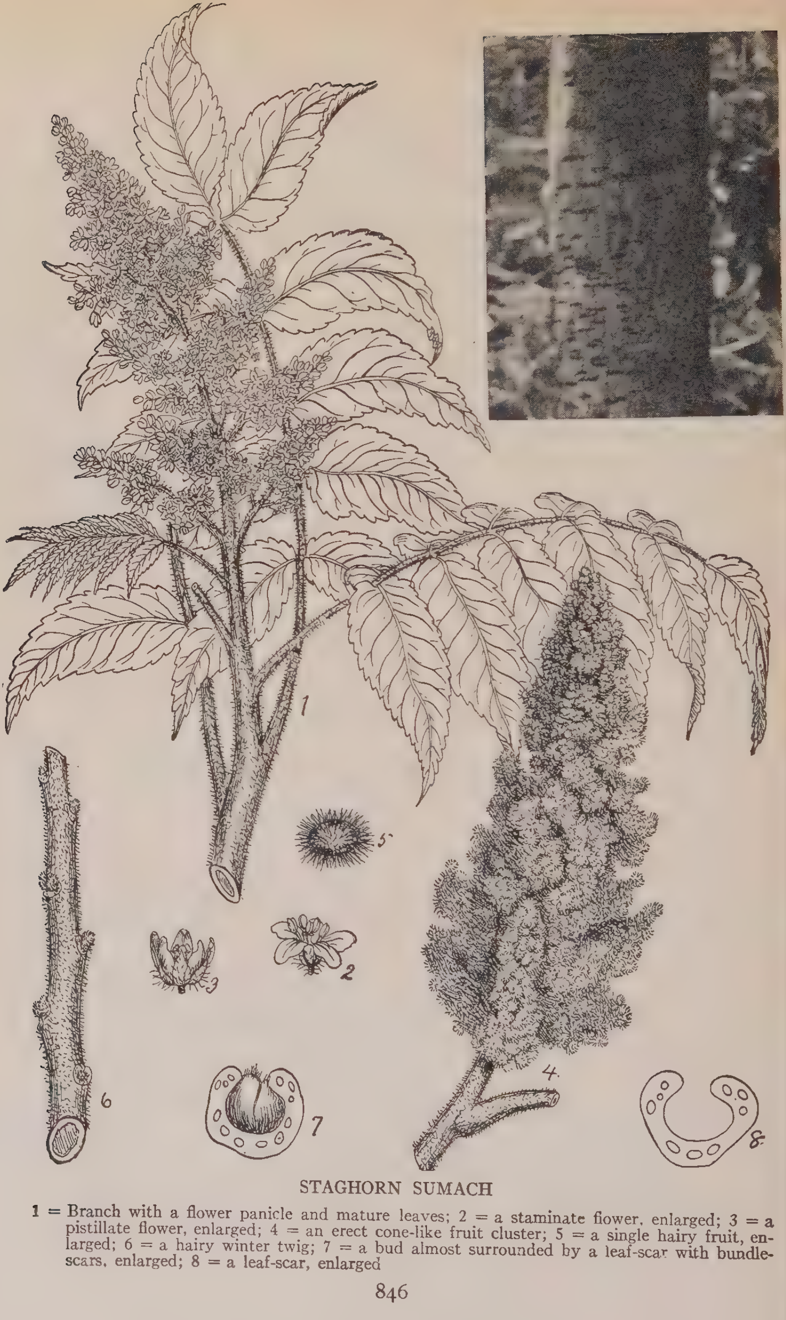
OTHER NAMES.—Hairy Sumach; Velvet Sumach.

GENERAL DESCRIPTION.—*Shape:* small tree with broad, flat-topped crown. *Height:* 10 to 20, sometimes 40 feet. *Bark:* rich in tannin, on old trunks rough and dark brown; on young trunks smooth, thin, covered with numerous large yellowish-brown dots (lenticels). *Buds:* small, conical, rusty brown, hairy. *Leaves:* alternate, compound, 16 to 24 inches long with 11 to 31 leaflets. *Leaf-scars:* U-shaped, nearly encircle buds, contain 3 groups of bundle-scars. *Flowers:* appear about May and are arranged in panicles 5 to 12 inches high and 4 to 6 inches broad. *Fruit:* small, round, drupes arranged in conspicuous red heads 5 to 8 inches long and 4 to 6 inches broad.

PREFERRED HABITAT.—Fertile dry soil. Rare in wet places. Common in abandoned mountain fields.

RANGE.—New Brunswick to Minnesota, south to Georgia and Alabama.

THE Staghorn Sumach is the largest of the several kinds of Sumachs found in eastern North America. No other native or introduced tree or



STAGHORN SUMACH

1 = Branch with a flower panicle and mature leaves; 2 = a staminate flower, enlarged; 3 = a pistillate flower, enlarged; 4 = an erect cone-like fruit cluster; 5 = a single hairy fruit, enlarged; 6 = a hairy winter twig; 7 = a bud almost surrounded by a leaf-scar with bundle-scars, enlarged; 8 = a leaf-scar, enlarged shrub is easier to identify. The stout branches are covered throughout the year by a dense velvety coating of hairs. The bark on the trunk is dark brown, somewhat scaly, marked with yellowish raised dots, and contains tannin.

The country boy has a sure method of becoming acquainted with this tree. Upon cutting its twigs he finds that a milky and gummy secretion flows forth from the cut section. It adheres to the skin or knife-blade, and turns black immediately upon exposure.

In spring and summer the alternate large compound leaves, with eleven to thirty-one leaflets, and covered with a dense coating of hairs, are distinctive. During May and June the dense yellowish-green panicles of flowers are very positive means of identification.

Its most impressive distinguishing characteristic is its conspicuous bright red clusters of fruit arranged in erect heads about seven inches long and three inches wide.

A distinctly porous, brittle, rather satiny orange-colored wood is found in the stem. It weighs about twenty-seven pounds per cubic foot. In some localities the pith is removed from short sections of twigs, which are then used as crude spigots to convey the sap of Sugar Maple trees into buckets.

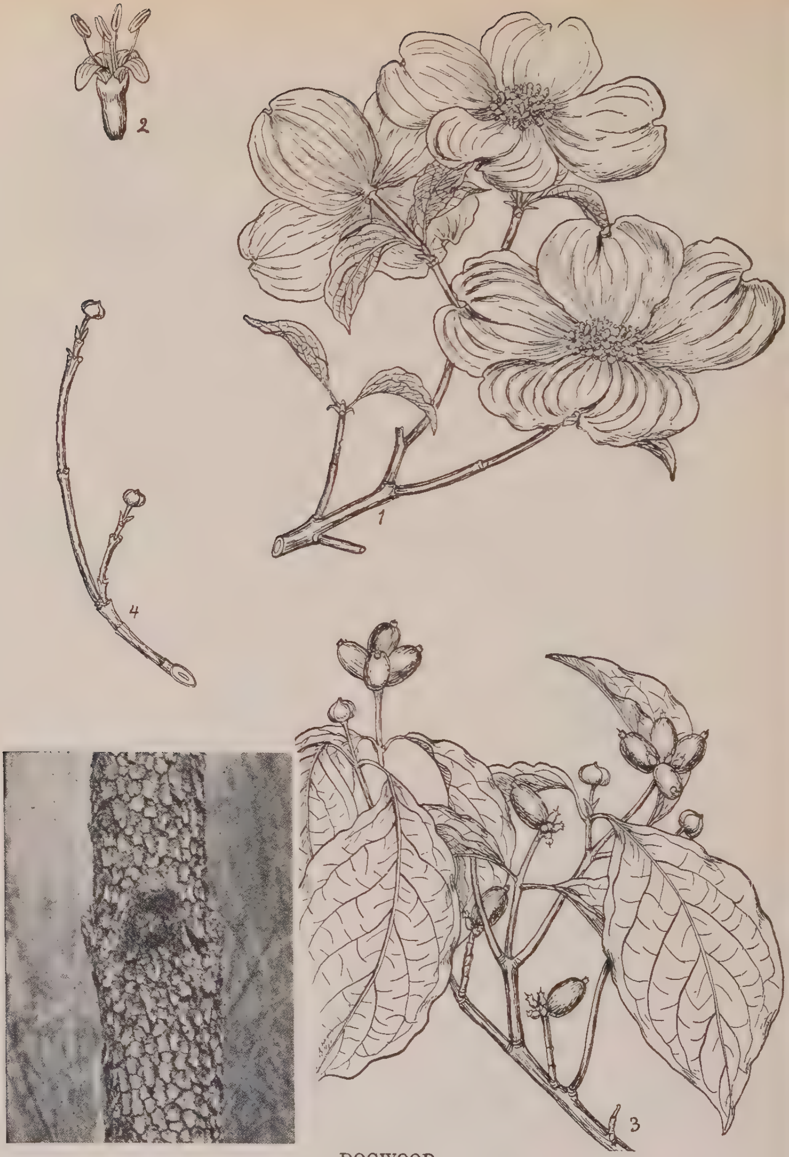
THE DOGWOOD FAMILY

CORNACEÆ

THE Dogwood Family comprises fifteen different groups of plants found chiefly in temperate regions. The only two groups which have representatives in North America are the Dogwoods and the Gums.

The Dogwoods comprise forty different kinds of plants, chiefly trees and shrubs. They are distributed widely in temperate regions, and some of them yield a very hard and valuable wood. Fifteen species have been identified in North America. Most of them are shrubs, only three attaining tree size. One species is a low herb, and grows extensively in the northern woods.

The Gums, belonging to the group of trees known techni-



DOGWOOD

1 = A flowering branch with three clusters of flowers, each surrounded by a showy four-bracted white involucre; 2 = a single flower, enlarged; 3 = a fruiting branch with mature leaves; **4** = a winter twig with two terminal spherical flower-buds cally as *Nyssa*, comprise only a few species, and have a rather restricted distribution. Only seven species are known in the world, five of which are native to the eastern United States and two of them are found in southern Asia.

FLOWERING DOGWOOD

CORNUS FLORIDA *Linnæus*

FAMILY.—Dogwood.

OTHER NAMES.—Flowering Cornel; Dogwood; Boxwood.

GENERAL DESCRIPTION.—*Shape:* bushy, low-crowned, broad-topped. *Height:* 15 to 25, sometimes 40 feet. *Bark:* bitter, ill-smelling, reddish-brown to black, broken up into square blocks. *Buds:* flower-buds large, round, goblet-like; leaf-buds small, sharp-pointed, sometimes barely visible. *Leaves:* opposite, simple, ovate, sharp-pointed, wedge-shaped at base, and entire on margin. *Flowers:* appear April to June, arranged in dense heads, and surrounded by four large, white, leaf-like bracts. *Fruit:* a scarlet, egg-shaped berry.

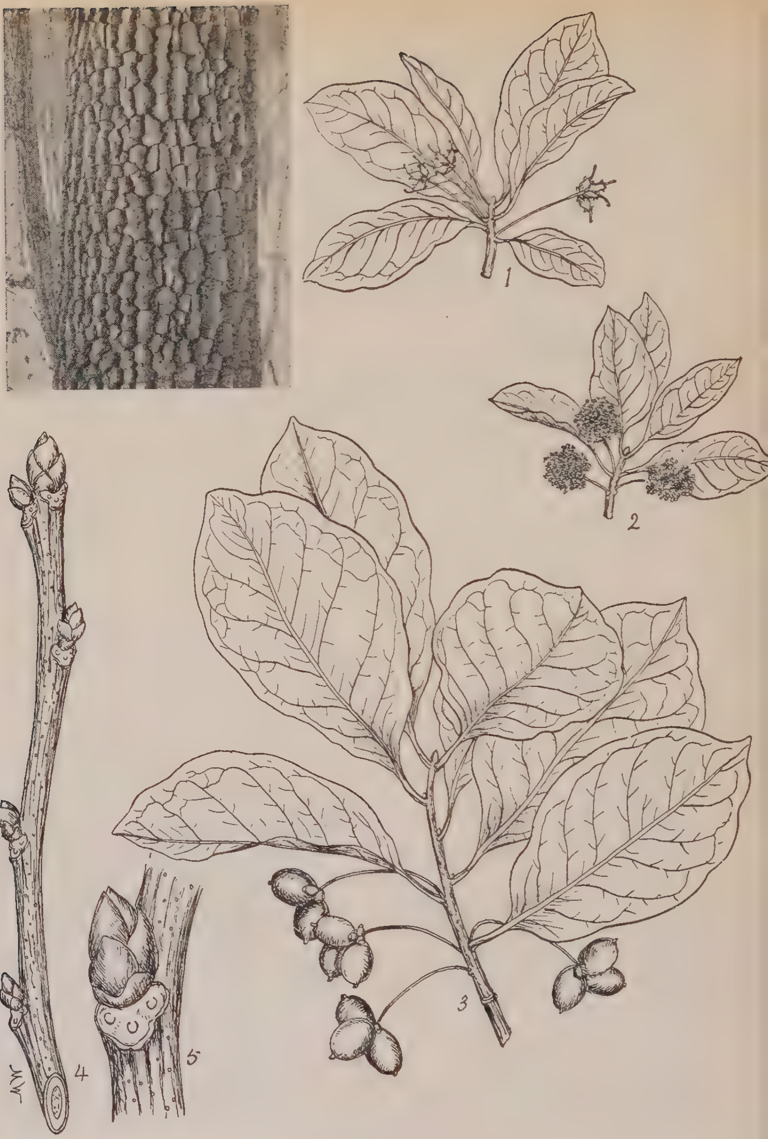
PREFERRED HABITAT.—Thrives best in low, moist, and rather fertile situations. Usually found in the understory of the forest, along fence rows, and in waste places.

RANGE.—Massachusetts to Michigan and Missouri, and south to Florida and Texas.

THE Flowering Dogwood is one of the best-known small trees of the forests of eastern North America. In spring the tree is often so densely covered with pretty white flowers that it appears like an enormous bouquet. At this season it is the glory of the understory of the forest. In summer its dense and deep green foliage gives it character, and in autumn the small clusters of scarlet berries and the dark red autumnal coloration of the leaves are a sure means of identification.

It has the most distinctive flower buds of any American tree. They resemble a goblet in outline, are about one-fifth of an inch in diameter, occur at the end of the branches, and are covered with two opposite pairs of bud scales. This tree has two other distinguishing characteristics, which are present at all seasons of the year, namely, the bitter, ill-smelling, reddish-brown to black bark, which breaks up into squarish blocks, and the reddish twigs, which are often streaked with green. If one has a pocket-knife and is willing to bore through the outer bark, he will find a pink inner bark, a characteristic which no other tree possesses in such good measure.

The wood is very hard, strong, tough, pale reddish to pinkish in color, and weighs over fifty pounds per cubic foot. Shuttles, golf-stick heads, brush blocks, engravers' blocks, and tool handles are some of its principal uses.



BLACK GUM

1 = A pistillate flowering branch; 2 = a staminate flowering branch; 3 = a fruiting branch with mature leaves; 4 = a winter twig, natural size; 5 = section of a winter twig, enlarged

AMERICAN HOLLY

BLACK GUM

NYSSA SYLVATICA *Marshall*

FAMILY.—Dogwood.

OTHER NAMES.—Sour Gum; Tupelo; Pepperidge.

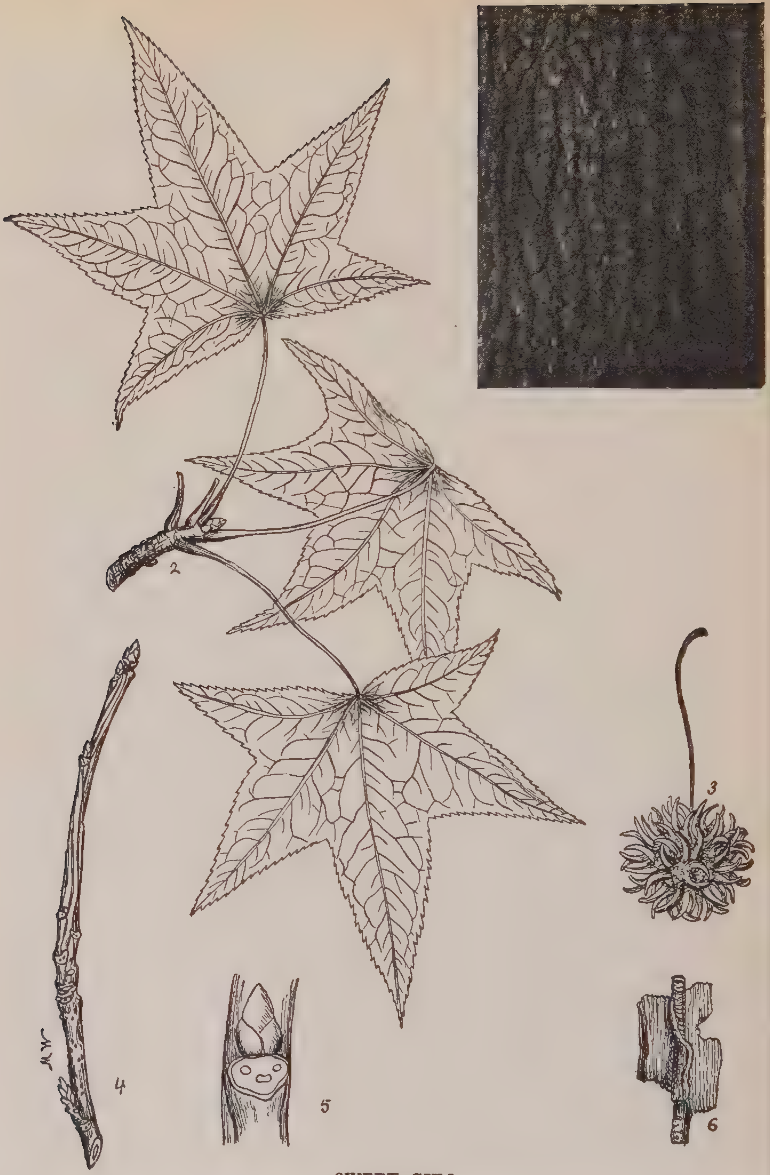
GENERAL DESCRIPTION.—*Shape:* low and flat-crowned; trunk continuous; lateral branches often horizontal. *Height:* 40 to 50, sometimes 100 feet. *Bark:* on twigs smooth and grayish-brown; on young trunks grayish and scaly; on old trunks rough, deep-fissured, broken up into squarish blocks. *Buds:* egg-shaped, 1/4 of an inch long, covered with 3 to 5 reddish-brown scales. *Leaves:* alternate, simple, egg-shaped, 2 to 5 inches long, deep green and shiny, entire on margin. *Leaf-scars:* broadly crescent-shaped with three distinct bundle-scars. *Flowers:* appear in May or June in small inconspicuous clusters on short stalks. *Fruit:* a dark-blue fleshy berry about 1/2 of an inch long.

PREFERRED HABITAT.—Reaches its best development along streams and in low, wet places.

RANGE.—Maine to Florida, and west to Michigan and Texas.

THERE is a great lack in the uniformity of the common names of this tree. It is known as Black Gum in fifteen States, as Sour Gum in fourteen, as Tupelo in eleven, and Pepperidge in eight of them. The stem usually rises to the top of the tree without dividing, bears drooping lateral branches near the base, horizontal along the middle, and ascending near the top. On old trunks the rough, deep-fissured bark, which breaks up into squarish blocks, is very distinctive. The smooth grayish-brown twigs bearing broadly crescent-shaped leaf-scars, and with three distinct bundle-scars and reddish-brown buds, are helpful means of identification in winter. During the summer the simple, shiny, dark-green, and entire-margined leaves arranged in horizontal sprays are good and positive distinguishing characteristics. Nobody can fail to recognize the Black Gum in autumn, when its dark-purple drupes are ripe and the foliage becomes a glowing mass of scarlet, sometimes touched with dashes of orange. It is unquestionably the most brilliant of all the gayly colored trees of hardwood forests.

The wood is light-yellow, cross-grained, hard to work, moderately strong and stiff, and not durable when in contact with the soil. Its grain is so twisted and interwoven that it is almost impossible to split the wood. The wood weighs about thirty-seven pounds per cubic foot, and is used for hubs of wheels, rolling pins, chopping bowls, rollers for wire ropes, ox-yokes, and pulpwood.



SWEET GUM

2 = A branch with mature leaves; 3 = a spherical fruit; 4 = a winter twig; 5 = section of a winter twig, enlarged; 6 = section of a branch with corky projection

THE WITCH-HAZEL FAMILY

HAMAMELIDACEÆ

THE Witch-hazel Family contains sixteen different groups of trees and shrubs which are found in regions bordering the tropics. Two of the sixteen groups have a single tree representative each in the United States. They are:

1. The Witch-hazel.
2. The Sweet Gum.

The Witch-hazel is the only tree or shrub native to the eastern United States which flowers and fruits at the same season of the year. It produces its brilliant yellow flowers late in autumn, which develop into fruit which matures the following autumn. Only three species of Witch-hazel are known in the world, two of which are found in eastern Asia and the other is native to the United States.

Our native Sweet Gum is one of three species belonging to the group and known under the scientific name *Liquidambar.* The other two species are native to Asia.

SWEET GUM

LIQUIDAMBAR STYRACIFLUA *Linnæus*

FAMILY.—Witch-hazel.

OTHER NAMES.—Liquidambar; Red Gum; Bilsted.

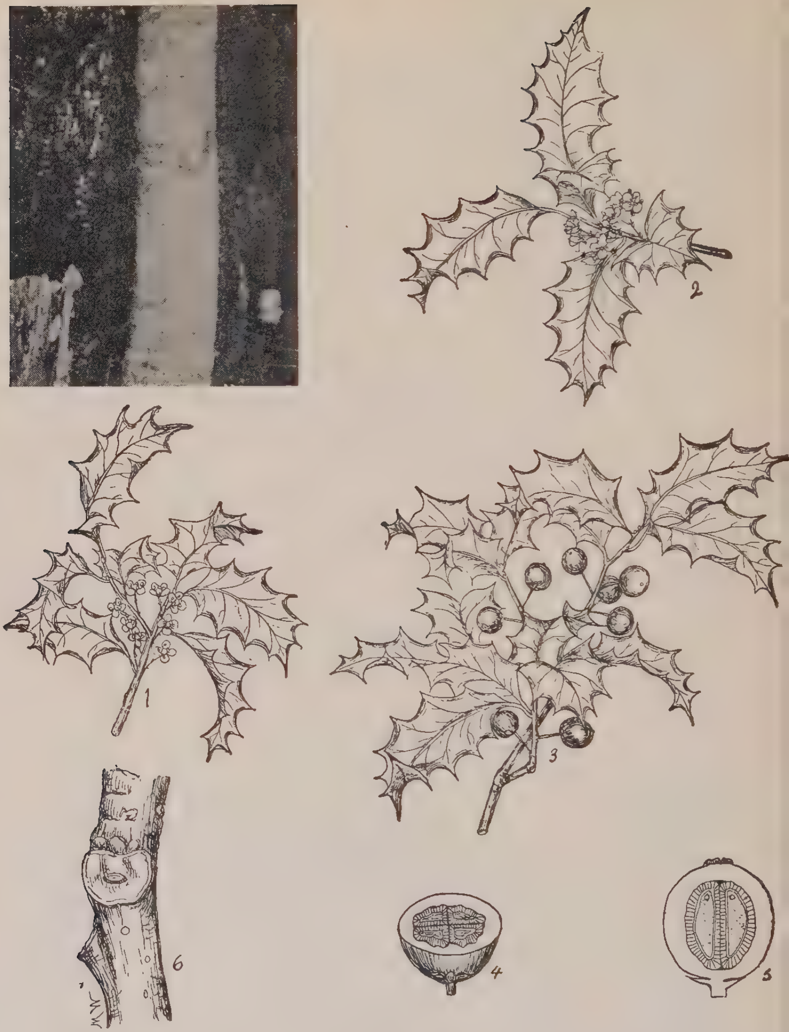
GENERAL DESCRIPTION.—*Shape:* handsome, symmetrical, often conical. *Height:* 50 to 75, sometimes 150 feet. *Bark:* on old trunks light brown to dark gray; on twigs light brown with corky-winged projections. *Buds:* glossy, fragrant if crushed, covered with about 6 rich reddish-brown scales. *Leaves:* alternate, simple, star-shaped, 3 to 5 inches long, broader than long. *Leaf-scars:* crescent-shaped, contain 3 bundle-scars. *Flowers:* appear about April in heads suspended on slender stalks. *Fruit:* long-stalked spherical head, made up of many capsules with spine-like projections.

PREFERRED HABITAT.—Prefers rich soil, endures swamps, but does not tolerate dense shade.

RANGE.—Southern Connecticut to Florida and Guatemala, and west to Missouri and Texas.

THE Sweet Gum is intimately linked with the life of the southern plantations, for it is recorded that many a slave sought shelter temporarily in

Photo by U. S. Forest Service



HOLLY

1 = A pistillate flowering branch; 2 = a staminate flowering branch; 3 = a fruiting branch; 4 = cross-section of a fruit, enlarged; 5 = longitudinal section of a fruit, enlarged; 6 = section of a twig, enlarged

the hollow trunk of a large Sweet Gum tree located in the numerous, rather inaccessible, swamps of the South, and there awaited the occasion when he could make his escape northward in safety.

It has many striking distinguishing characteristics at all seasons of the year. No other tree in the United States has such typical star-shaped leaves. In summer, the upper surface of the leaves is lustrous green in color, and their autumnal coloration is a conflagration of red, yellow, and purple. The fruit is unique, consisting of a long-stalked spherical head, made up of projecting and sharp-pointed capsules, and often persists far into winter. The twigs bear corky-winged projections, which are present at all seasons of the year, and serve as an excellent means of identification. The buds, if crushed, give forth a fragrant odor.

The Sweet Gum attains a large size in the southern portion of its range, and produces a rather valuable wood, which weighs about thirty-seven pounds per cubic foot, and is used extensively for boxes, crates, furniture, interior finishings, and as a successful substitute for Circassian Walnut.

THE HOLLY FAMILY

AQUIFOLIACEÆ

THE Holly Family comprises three different groups of trees and shrubs with a total membership of 290 species. Most of the representatives occur in temperate and tropical regions. Seventy distinct species have been identified in northern Brazil.

The American Holly and the closely related European Holly are the two species which have been used extensively for ornamental planting and are linked inseparably with our Christmas traditions. The European Holly has been propagated so long and intensively that 153 distinct varieties are now recognized.

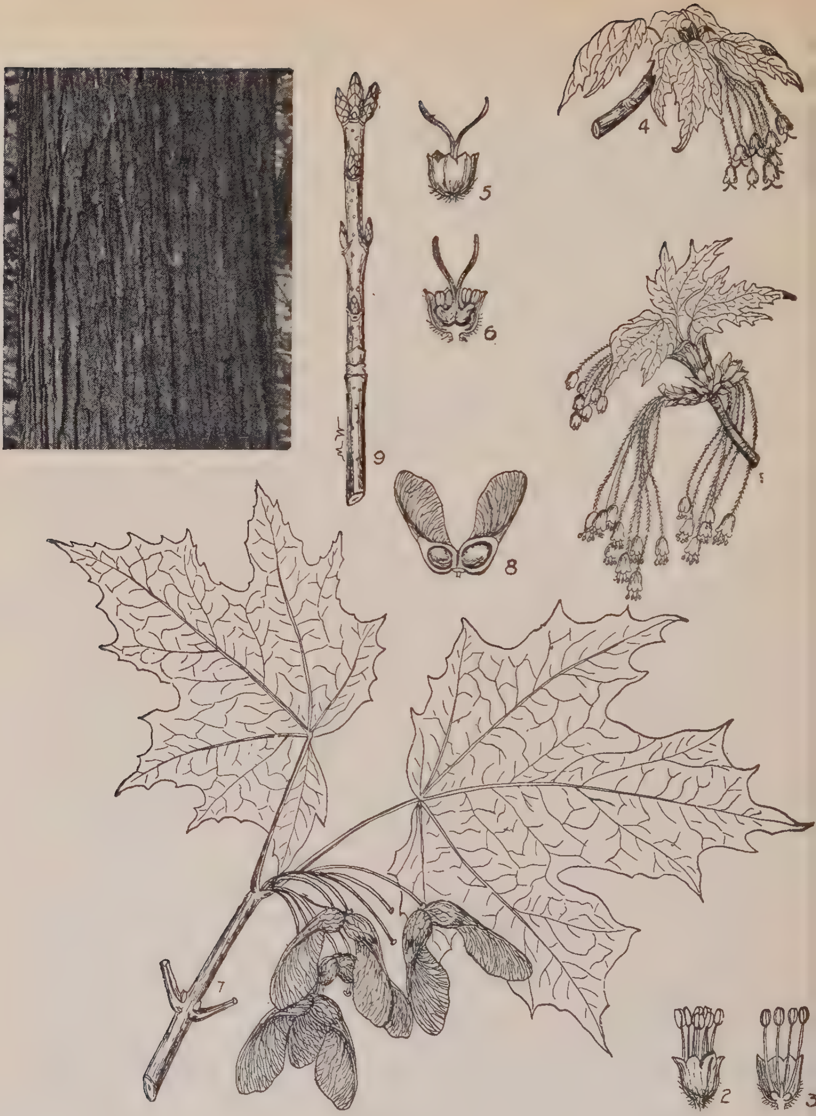
AMERICAN HOLLY

ILEX OPACA *Aiton*

FAMILY.—Holly.

OTHER NAMES.—Holly; Christmas Holly; White Holly.

GENERAL DESCRIPTION.—*Shape:* trunk short, rather slender; crown conic with slender ascending lateral branches. *Height:* 15 to 30, sometimes 50 feet. *Bark:* close-fitting,



SUGAR MAPLE

1 = Branch with immature leaves and staminate blossoms; 2 = staminate flower with calyx, enlarged; 3 = longitudinal section of staminate flower, enlarged; 4 = branch with immature leaves and pistillate blossoms; 5 = pistillate flower with calyx, enlarged; 6 = longitudinal section of flower with both a pistil and stamens enlarged; 7 = branch with mature leaves and cluster of fruit; 8 = a maple key with exposed seeds; 9 = winter twig showing lenticels, leaf-scars, bud-scale scars, and sharp-pointed opposite buds

margin. In winter it may be distinguished by its stout twigs, bearing large, blunt-pointed, green buds.

The Japanese Maples were, as their name implies, imported from Japan, and have been set out extensively on lawns and in parks. They may be recognized by their deep reddish-purple coloring and deeply and finely cut leaves. In some varieties the leaves are cut almost to the midrib, and present a fringe-like effect.

Sugar Maple

Acer saccharum *Marshall*

Family.—Maple.

Other Names.—Hard Maple; Rock Maple.

General Description.—*Shape:* spreading, egg-shaped, round-topped crown. *Height:* 60 to 75, sometimes 120 feet. *Bark:* on branches and young trunks smooth and light-brown; on old trunks brown, hard, roughened by shallow fissures. *Buds:* conical, sharp-pointed, clustered at end of twigs, covered with 8 to 16 exposed brown scales. *Leaves:* opposite, simple, usually five-lobed, wavy on margin, 3 to 5 inches long, 4 to 6 inches wide, bright green above, pale green below. *Leaf-scars:* V-shaped to U-shaped, nearly encircle twigs. *Flowers:* small, bell-shaped, appear in April and May with the leaves, arranged in drooping clusters. *Fruit:* a winged key, ½ to 1 inch long, matures about September, arranged in drooping clusters.

Preferred Habitat.—Well-drained, rich soil.

Range.—Newfoundland to Manitoba, south to Florida and Texas.

The Sugar Maple is probably the best known hardwood tree native to North America. Its beauty, cleanliness and healthy appearance are known to all who have visited the Northwoods.

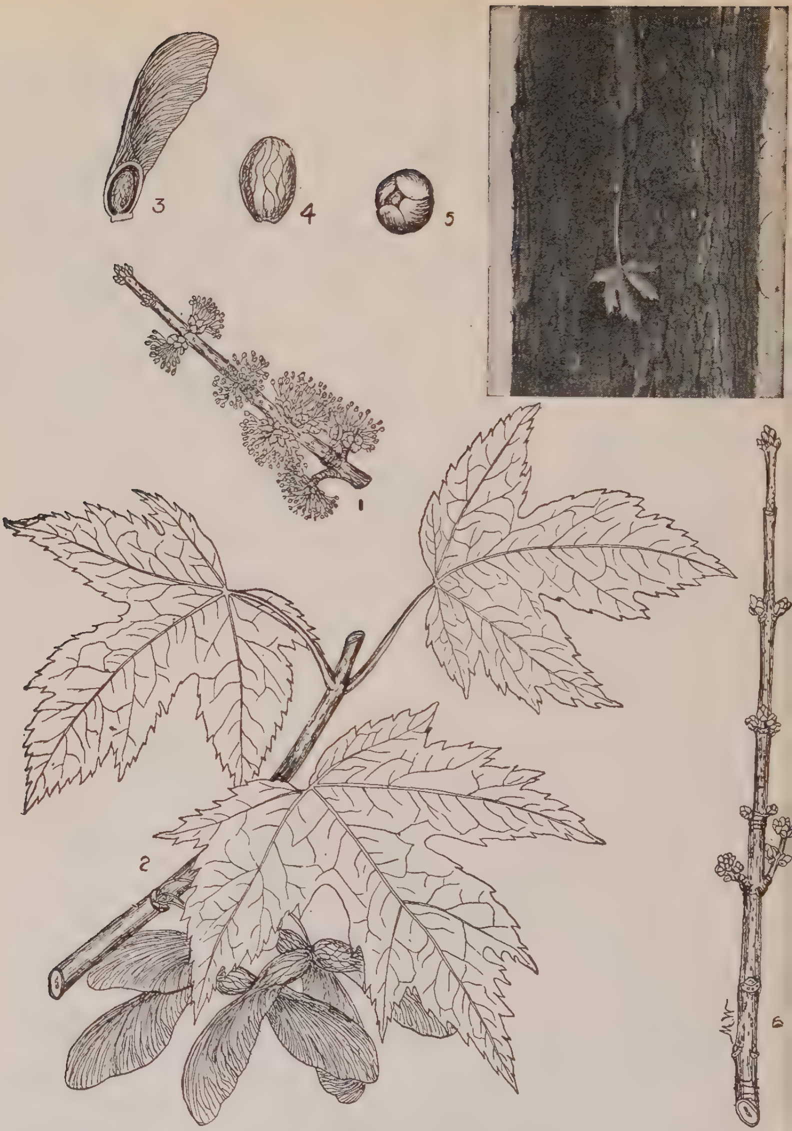
This prince of our forest trees is distinguished easily at all seasons of the year. The brown bark on old trunks is roughened by shallow furrows, and the slender brown twigs are marked with pale dots (lenticels).

Its leaves are large, simple, thin in texture and have their lobes coarsely toothed. The flowers appear with the leaves. The fruit clusters are usually developed from terminal buds. Its fruit does not mature until September, while the fruit of the Red Maple and Silver Maple ripens in early summer.

The Sugar Maple produces immense numbers of seeds, which germinate soon after falling to the ground and develop into small seedlings.

In winter the opposite sharp-pointed, conical buds covered with eight to sixteen exposed brown scales are a sure means of identification.

The wood of the Sugar Maple is heavy, hard, strong and fine-grained. It has a smooth, satiny surface, polishes well, splits easily, and when burned as fuel produces much heat.



SILVER MAPLE

1 = Flowering branch; 2 = branch with mature leaves and mature fruit; 3 = a wing of a maple key with exposed seed; 4 = a seed, enlarged; 5 = end view of a seed, enlarged; 6 = a winter twig showing buds, lenticels, leaf-scars, bud-scale scars and bundle-scars

The Sugar Maple deserves to be protected carefully in the forests. It lives long, produces valuable wood, yields delicious syrup and sugar, furnishes excellent shade, and possesses some of the cleanest and most beautiful features of any American tree. As a Memorial Tree, the Sugar Maple has no superior.

SILVER MAPLE

ACER SACCHARINUM *Linnæus*

FAMILY.—Maple.

OTHER NAMES.—White Maple; River Maple; Soft Maple.

GENERAL DESCRIPTION.—*Shape:* short-trunked, broad-crowned, with long, drooping, lateral branches. *Height:* 50 to 60, sometimes 120 feet. *Bark:* on branches and young trunks smooth and gray; on old trunks brown and scaly. *Buds:* opposite, red, blunt-pointed, covered with 6 to 8 overlapping scales. *Leaves:* opposite, simple, 5-lobed, deeply toothed, bright green on upper surface, and silvery white on lower surface. *Flowers:* appear in March or April before the leaves are out; occur in dense axillary clusters along twigs. *Fruit:* a two-winged key, 1 to 2 inches long, and occurs in clusters; mature about May.

PREFERRED HABITAT.—Moist, deep soil, common along streams and in swamps.

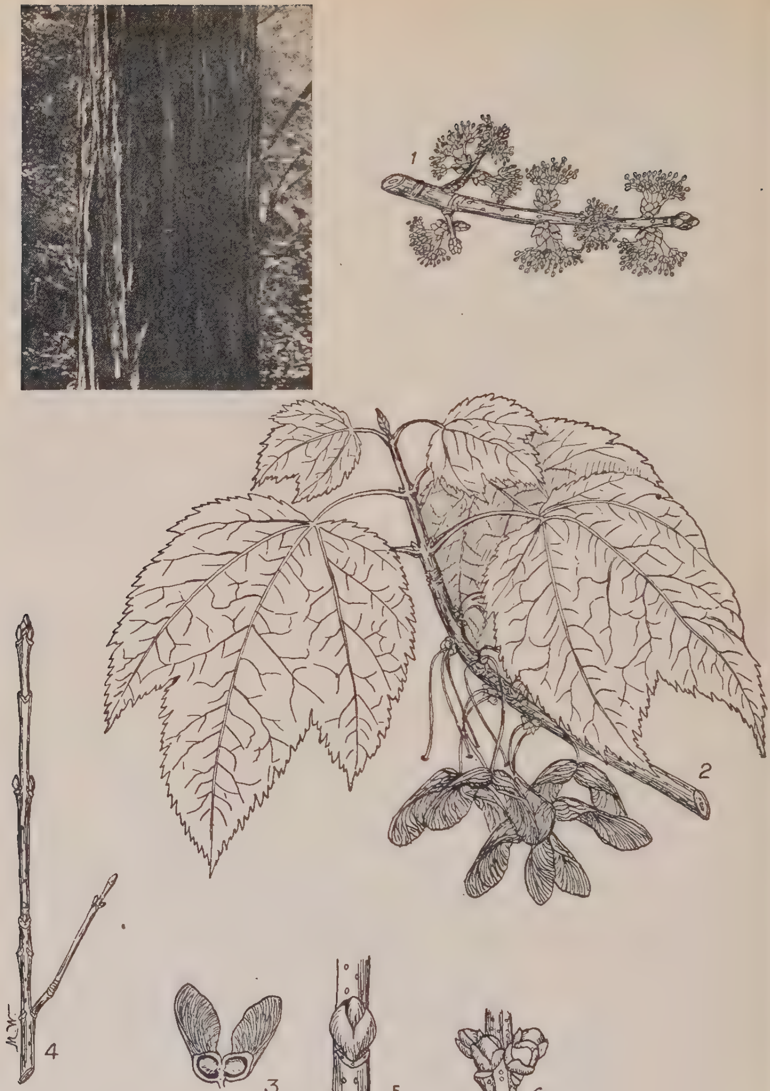
RANGE.—New Brunswick to southern Ontario, south to Florida and Indian Territory.

THE Silver Maple is a favorite with those who desire to secure shade with as little delay as possible. It grows rapidly, and adapts itself to a great variety of soils, but does not flourish upon dry situations. It likes the river banks and borders of ponds.

In summer the Silver Maple may be recognized by its leaves with a silvery-white lower surface and deep, round-based clefts. In winter it can be distinguished from all maples excepting the Red Maple by its numerous, round, red, collateral buds, and from the Red Maple by its bright chestnut-brown twigs, which give forth a pungent odor if broken.

Its bark is somewhat furrowed, and separates into thin, long scales, which are loose at both ends and fastened in the middle. The bending down of the branches and the distinct upward swoop of their small end is a very helpful distinguishing characteristic.

The Silver Maple has been planted widely for ornamental purposes. It is one of the first trees to bloom in spring, has an attractive, clean bark, produces beautiful leaves, and its outline and poise somewhat suggest an elm. Before planting it for ornamental purposes one should know that it is short-lived, and its branches are so brittle that they are frequently broken off in winter by the wind and snow and ice pressure.



RED MAPLE

1 = Flowering branch; 2 = branch with mature leaves and mature fruit; 3 = a maple key with exposed seeds; 4 = a winter branch; 5 = section of winter twig showing lenticels, a leaf-scar, and a gaping lateral bud, natural size; 6 = section of twig showing conspicuous lenticels, and a cluster of accessory buds, natural size

RED MAPLE

ACER RUBRUM *Linnæus*

FAMILY.—Maple.

OTHER NAMES.—Soft Maple; Swamp Maple; White Maple.

GENERAL DESCRIPTION.—*Shape:* deep, broad and dense crowned and short trunked if grown in open; in dense stands trunk is long and crown shallow and round-topped. *Height:* 50 to 70, sometimes 100 feet, with a diameter of 4 feet. *Bark:* on branches and young trunks smooth and gray; on old trunks dark grayish, thick and shaggy. *Buds:* opposite, red, covered with 6 to 8 exposed scales; flower-buds stout, round; leaf-buds pointed, flattened. *Leaves:* opposite, simple, 3 to 5 lobed, bright green above and light green to whitish on lower surface; leaf-clefts shallow and sharp-based. *Flowers:* appear in March or April before the leaves; occur in dense clusters along twigs. *Fruit:* a two-winged key, usually less than 1 inch long, matures about May, grouped in small drooping clusters.

PREFERRED HABITAT.—Moist, deep soil. Common along streams and about swamps.

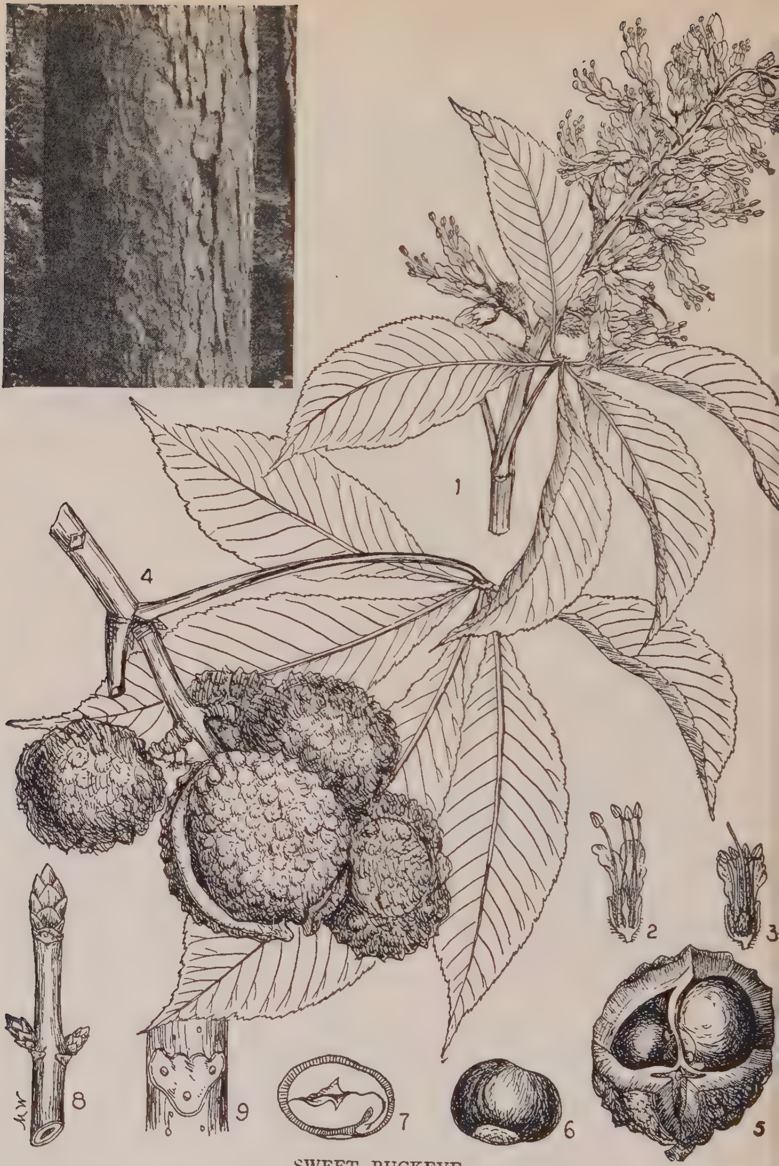
RANGE.—Nova Scotia to Manitoba, south to Florida and Texas.

THE Red Maple never forgets its common name. At all seasons of the year some part of it is distinctly red. Early in spring the red clusters of flowers appear, and red are the wings of the dainty, key-like fruit. In summer there is a tinge of red on the veins of the leaves, and in autumn the whole tree stands out among its neighbors as a flaming torch.

The Red Maple can be recognized in summer by its simple, rather small, 3 to 5 lobed leaves, which are light green to whitish on the lower surface. The clefts of the leaves are shallow and sharp-pointed at the base.

In winter we find the Red Maple bare of foliage and displaying its dark grayish, often knotty trunk, clean, smooth, grayish branches, and its bright red twigs loaded heavily with winter buds. In winter it is often difficult to distinguish the Red Maple from the Silver Maple. The latter, however, lacks the lustrous red twigs, and if the twigs of the Silver Maple are broken they give off a pungent odor not found in the Red Maple.

If there is one maple that excels all others in beauty in the forest it must be the Red Maple. It thrives when planted along village streets and in parks, but it is short-lived and needs plenty of moisture.



SWEET BUCKEYE

1 = A flowering branch; 2 = a flower with stigma below anthers, natural size; 3 = a flower with stigma above anthers, natural size; 4 = a fruiting branch; 5 = a fruit with part of shell removed showing two seeds; 6 = a seed; 7 = longitudinal section of a seed; 8 = a winter twig; 9 = section of a winter twig showing a leaf-scar with bundle-scars, natural size

THE SOAPBERRY FAMILY

SAPINDACEÆ

THE Soapberry Family is a large one. It comprises more than 1,000 different species, which are sometimes treated as members of the Horse-Chestnut Family, and a few writers consider them under the Buckeye Family.

The representatives of this family are commonest in the tropical region of the Old World. The Horse-Chestnuts and Buckeyes are the best known groups of the family. Ten species are native to the United States, and a number of them are fairly valuable timber trees and suitable for ornamental planting about the house, and especially along the streets of a city.

The Horse-Chestnut, which is a native to southeastern Europe, has been planted extensively throughout Continental Europe, Great Britain, and the United States. It is one of the best known shade and ornamental trees of the world. In Paris alone 17,000 trees are growing. It was introduced into the United States in 1746. When in bloom it is a superb sight, for in many instances entire trees appear to be covered with panicles of blossoms.

SWEET BUCKEYE

AESCULUS OCTANDRA *Marshall*

FAMILY.—Horse-chestnut; Soapberry.

OTHER NAMES.—Yellow Buckeye; Big Buckeye.

GENERAL DESCRIPTION.—*Shape:* medium-sized tree with a pyramid-like, round-topped crown. *Height:* 50 to 60, sometimes 110 feet. *Bark:* light brown to grayish-brown and breaking up into thin irregular scales. *Buds:* large, opposite, non-resinous, covered with numerous reddish-brown scales. *Leaves:* opposite, palmately compound, with 5, sometimes 7 leaflets, 4 to 10 inches long. *Leaf-scars:* large, heart-shaped with three conspicuous bundle-scars. *Flowers:* small, yellow or purplish, arranged in large panicles, and appear about April or May. *Fruit:* a large leathery and smooth capsule containing several shiny reddish-brown nuts which mature in October.

PREFERRED HABITAT.—Rich bottom-land and valleys and moist mountain slopes.

RANGE.—Western Pennsylvania, south to Georgia, west to Iowa and Texas.

THE Sweet Buckeye can readily be distinguished in summer by its large palmately compound leaves, with usually five leaflets, and its large panicles of yellowish to purplish flowers.

Another Buckeye is native to the central part of the United States. It is known as the Fetid Buckeye, or Ohio Buckeye (*Æsculus glabra* Willd.), and can be distinguished very easily from the Sweet Buckeye. The stamens of the flowers in the latter species are included *within* the corolla, while those of the former species extend *beyond* the corolla. The fruit of the Sweet Buckeye has a smooth leathery covering, and its buds are not resinous, while the fruit of the Fetid Buckeye has prickly projections on the husk of the fruit, and its buds are somewhat resinous. These two closely related species may also be distinguished by the pronounced ill-smelling odor which is given from the crushed twigs of the Fetid Buckeye.

The wood is weak, soft, and whitish to yellowish in color. It weighs about twenty-seven pounds per cubic foot, and is used for lumber, veneer, slack cooperage, paper pulp, candy boxes, dishes, bowls, and artificial limbs.

I do love a good tree. There it stands so strong and sturdy, and yet so beautiful—a very type of the best sort of man. How proudly it lifts its bare head to the winter storms, and with what a full heart it rejoices when the spring was come again! How grand its voice is, too, when it talks with the wind; a thousand aeolian harps cannot equal the beauty of the sighing of a great tree in leaf. All day it points to the sunshine, and all night to the stars; and thus passionless, and yet full of life, it endures through the centuries—come storm, come shine—drawing its sustenance from the deep bosom of its mother earth, and, as the slow years roll by, learning the great mysteries of growth and decay. And so on and on through generations; outliving individuals, customs, dynasties—all save the landscape it adorns and human nature.—H. RIDER HAGGARD.

THE LINDEN FAMILY

TILIACEÆ

THE Linden Family comprises thirty-five different groups of plants with a total membership of about 375 different species. Only one group has three representatives in the United States. It is technically known as *Tilia*, and comprises the Basswoods and Lindens, of which we have eight different native species.

In addition to the native species, a number of European Lindens are planted rather extensively as park and street trees in America. They are the Small-leaved Linden (*Tilia parvifolia*) and the Large-leaved Linden (*Tilia grandifolia*). Both species are excellent trees and deserve to be planted for ornamental and shade purposes wherever possible.

BASSWOOD

TILIA AMERICANA *Linnæus*

FAMILY.—Linden.

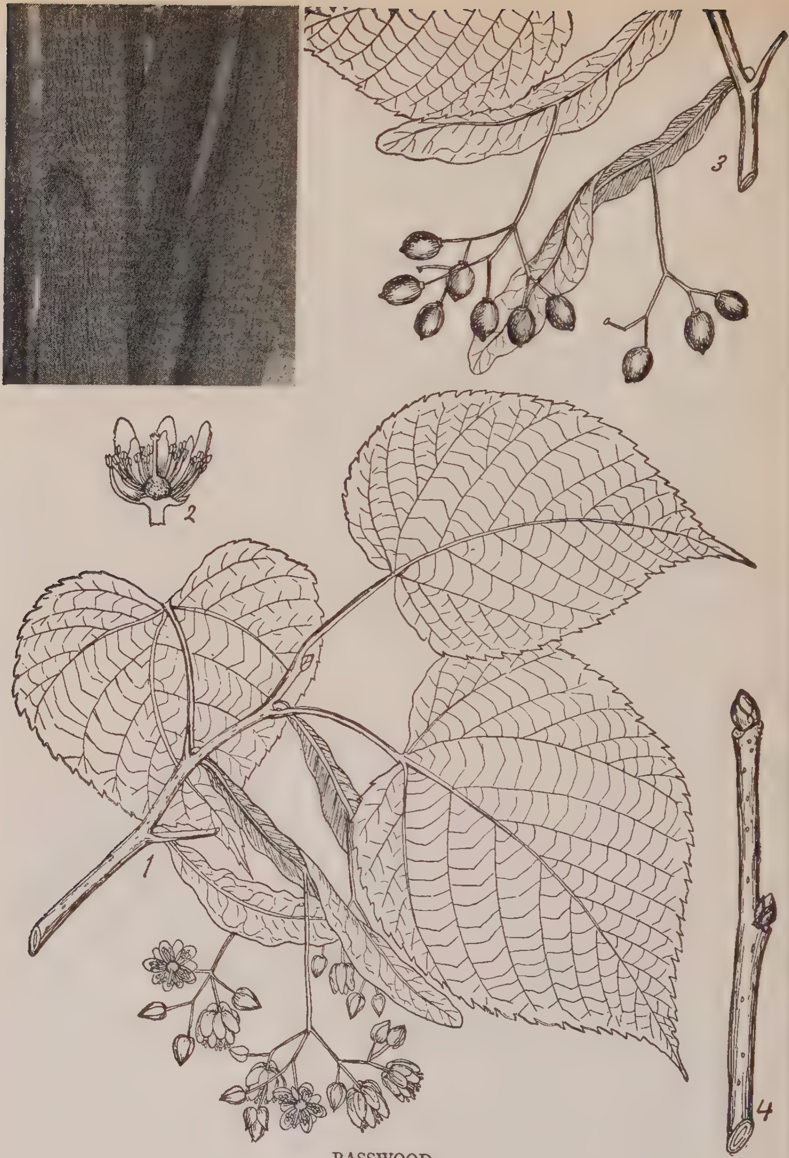
OTHER NAMES.—Linden; Lime-tree; White wood; Beetree; Whistle-wood; Lynn.

GENERAL DESCRIPTION.—*Shape:* broad, ovoid or rounded. *Height:* 60 to 70, sometimes 120 feet. *Bark:* on twigs smooth, shiny, bright red; on young stems dark gray and smooth; on old trunks dark gray, roughened by vertical furrows. *Buds:* egg-shaped, stout, unsymmetrical, covered with about 3 visible bright red scales. *Leaves:* alternate, simple, egg-shaped to round, oblique and heart-shaped at base, sharp-toothed on margin, long-pointed at apex. *Leaf-scars:* large, conspicuous, contain few to many bundle-scars. *Flowers:* fragrant, yellowish-white, arranged in clusters borne on long slender stalks attached to a leafy bract.

PREFERRED HABITAT.—Rich soils in bottom-lands, and moist, fertile mountain slopes. Usually mixed with other hardwoods.

RANGE.—New Brunswick to Manitoba, south to Georgia and eastern Texas.

THE Basswood is one of the important forest trees of the United States. It yields valuable timber and bark, produces attractive and fragrant flowers, and furnishes satisfactory shade.



BASSWOOD

1 = A flowering branch with mature leaves; 2 = longitudinal section of a flower, slightly enlarged; 3 = a fruiting branch; 4 = a winter twig

In summer the large firm and unequally based leaves and the fragrant white flowers borne in small clusters on slender stalks attached to a winged bract are distinctive. The flowers attract thousands of bees which manufacture from them a distinct brand of Basswood Honey. In autumn the woody, nut-like fruit occurring in small clusters attached to a winged bract is a positive distinguishing characteristic. The attachment of the seeds to the winged bracts is nature's way of providing for the scattering of the seed. In winter the lop-sided bright red buds with only three exposed bud-scales, and the dark gray and vertically-fissured bark, are excellent means of identification. If one takes a twig, cuts a cross-section, and examines it closely, he will see dark funnel-shaped areas in the inner bark alternating with lighter areas. This characteristic is rarely mentioned in books, but it is one of the best distinguishing characteristics this tree has.

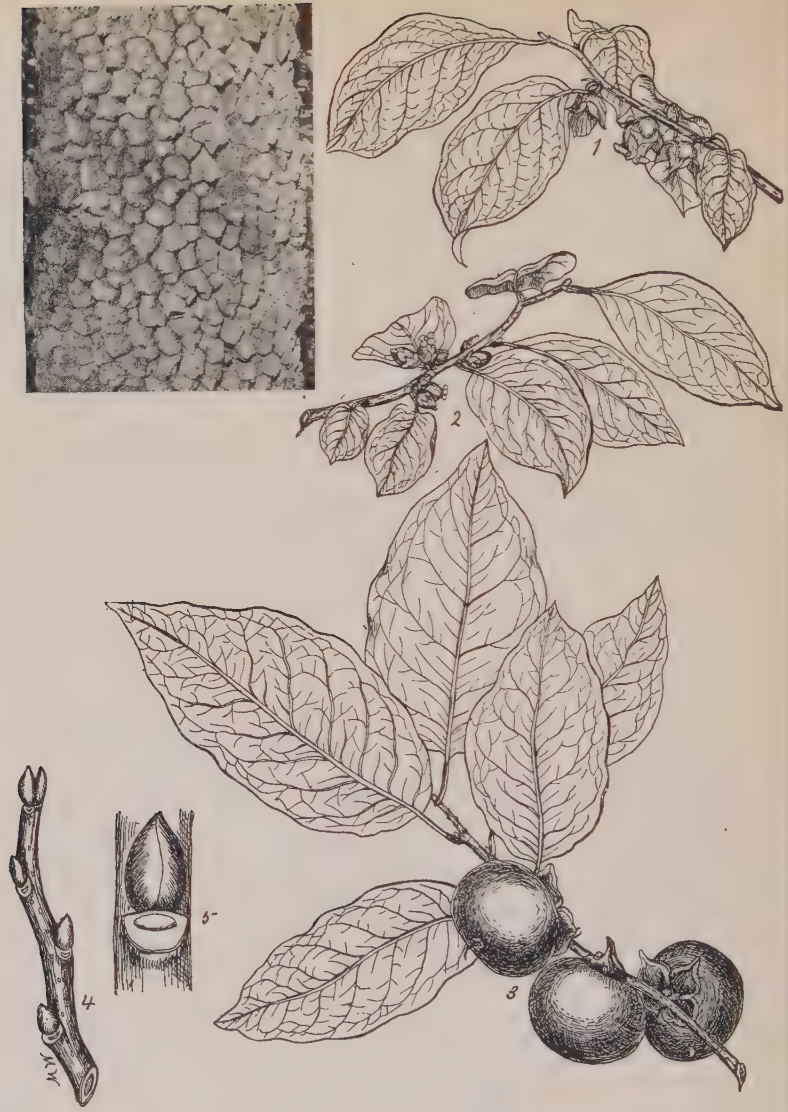
The wood is light, soft, light-brown to nearly white, and fine in texture. It weighs about twenty-eight pounds per cubic foot, and is used extensively for paper-pulp, cheap furniture, kegs, pails, barrel headings, berry boxes, and excelsior.

THE EBONY FAMILY

EBENACEÆ

THE Ebony Family has a large number of representatives in the tropics, but only a few members of it are found in temperate regions. Five different groups of trees and shrubs belong to this family, but only one of them has representatives in the United States. This one embraces the Persimmons, which are known under the scientific name of *Diospyros*.

Few people in the United States know that the Persimmons comprise 160 different species. This is probably due to their distribution, for only two species extend northward into the eastern United States, the remainder being found in the tropics, eastern and southwestern Asia, and the Mediterranean region. The real ebony of commerce is derived from a tree native to Ceylon and the East Indies.



PERSIMMON

1 = A branch with pistillate flowers; 2 = a branch with staminate flowers; 3 = a fruiting branch with mature leaves; 4 = a winter twig, natural size; 5 = section of a winter twig, enlarged

PERSIMMON

DIOSPYROS VIRGINIANA *Linnæus*

FAMILY.—Ebony.

OTHER NAMES.—Common Persimmon; Possumwood; Date Plum.

GENERAL DESCRIPTION.—*Shape:* trunk short and slender; crown broad-topped and high. *Height:* 25 to 50, sometimes 100 feet. *Bark:* dark brown to black, cinnamon-red, at bottoms of furrows, breaks up into squarish blocks. *Buds:* egg-shaped, 1/8 of an inch long, sharp-pointed, covered with 2 glossy dark-brown scales. *Leaves:* alternate, simple, oval, 4 to 6 inches long, dark green and shiny, entire on the margin. *Leaf-scars:* crescent-shaped, contain one prominent bundle-scar. *Flowers:* white, urn-shaped, arranged in small clusters, and appear about May or June. *Fruit:* a juicy, spherical, orange-colored berry, 1 to 1½ inch in diameter and containing 4 to 6 seeds.

PREFERRED HABITAT.—Rich bottom-lands, but prefers light, sandy, well-drained soil.

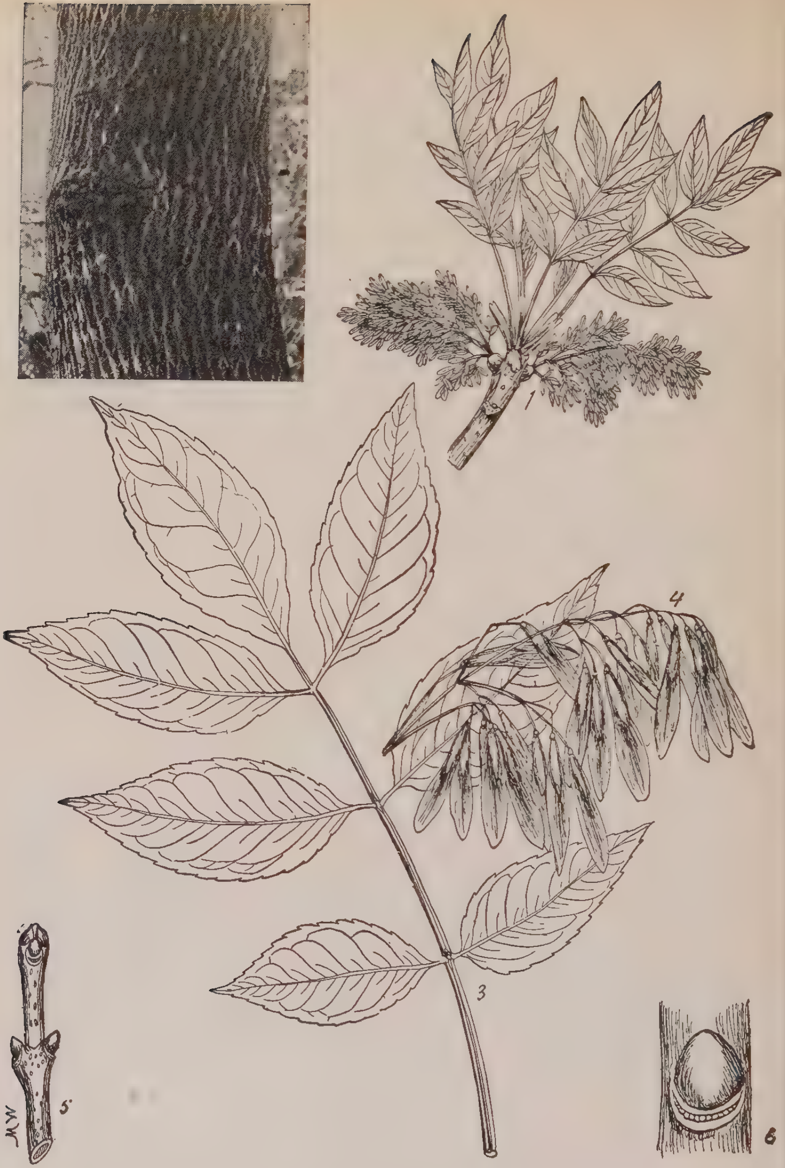
RANGE.—New York and Pennsylvania, south to Florida, and westward to Iowa and Texas.

THE Persimmon is one of the best known trees south of the Mason and Dixon line, and locally ventures northward into southern Pennsylvania, New Jersey, and New York. An isolated outpost occurs near New Haven, Connecticut.

The best way to fix the Persimmon tree indelibly in one's mind is to taste the unripe fruit. One of the delights of the boys of the South is to treat their friends from the North to a handful of apparently delicious local fruit, which in reality is extremely bitter and astringent. The fruit is a globular berry, about one and one-half inches in diameter, and pale orange red in color when ripe. The bitter taste disappears in late fall, and then the fruits are indeed delicious.

The simple entire-margined, deep-green leaves arranged alternately on the twigs are very distinctive in summer. During May and June the urn-shaped white flowers are usually present. The dark-brown to black bark, which breaks up into squarish blocks, is a sure means of identification at all seasons of the year. It is deep-furrowed, and distinctly cinnamon-red along the bottom of the furrows.

The wood of Persimmon is very heavy and hard, and is susceptible to a high polish. It weighs about fifty pounds per cubic foot, and is used for shuttles, billiard cues, mallets, parquet flooring, brush backs, and veneer.



WHITE ASH

1 = A branch with a cluster of staminate flowers and immature leaves; 3 = a mature compound leaf; 4 = a cluster of fruit; 5 = a winter twig; 6 = section of a winter twig, enlarged

THE OLIVE FAMILY

OLEACEÆ

THE Olive Family comprises over 500 representatives, which are distributed widely in temperate and tropical regions. It includes twenty-one different groups of trees and shrubs, some of which are valuable timber trees, while others are prized for ornamental purposes, or for the food which they yield.

The Common Olive Tree, cultivated in ancient times in Palestine and Syria, and now planted in commercial orchards so extensively in many of the warm parts of the world, belongs to this family. The common Lilacs and Privets, used widely for ornamentation and hedges, are also among its members.

The Ashes are the most important group of forest trees belonging to the Olive family. More than forty different species occur in the world, sixteen of which are native to North America. The two most important species of Ash in the world are the European Ash (*Fraxinus excelsior* L.) and our native White Ash. The former species has been planted extensively in the eastern United States for ornamental purposes.

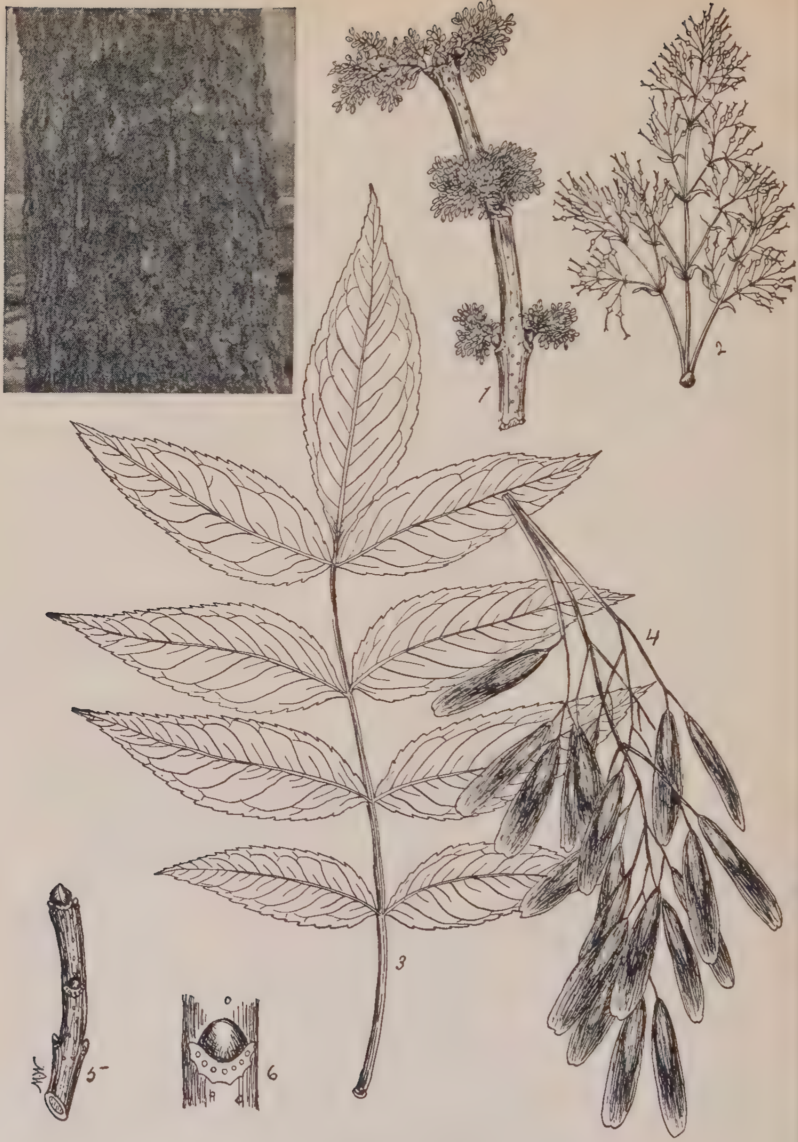
WHITE ASH

FRAXINUS AMERICANA *Linnæus*

FAMILY.—Olive.

OTHER NAMES.—American Ash; Ash; Canadian Ash.

GENERAL DESCRIPTION.—*Shape:* crown narrow, pyramidal; when grown in open, round-topped. *Height:* 70 to 80, sometimes 120 feet. *Bark:* grayish-brown, roughened by diamond-shaped fissures. *Buds:* egg-shaped, blunt-pointed, brown, covered with 2 to 3 pairs of visible scales. *Leaves:* opposite, compound with 5 to 9 leaflets; leaflets stalked and 3 to 5 inches long. *Leaf-scars:* semi-circular, notches on upper surface, con-



BLACK ASH

1 = Branch with staminate flowers; 2 = a panicle of pistillate flowers; 3 = a mature compound leaf; 4 = a cluster of fruit; 5 = a winter twig; 6 = section of a winter twig, enlarged tain numerous bundle-scars arranged in a curved line. *Flowers:* appear about May before the leaves; pollen-bearing in clusters; seed-bearing in loose panicles. *Fruit:* a winged seed 1 to 2 inches long and maturing in September.

PREFERRED HABITAT.—Fertile, moist soil. Common in rich woods, along streams and in swamps.

RANGE.—Nova Scotia to Minnesota, and southward to Florida and Texas.

THE White Ash is the most beautiful, useful, and distinctive of all the American species of Ash. When covered with foliage it is graceful and attractive, and during winter its large size, broad form, erect physique, and stout branches are impressive characteristics.

It may be recognized at all seasons of the year by the bark on the trunk, which is broken up into diamond-shaped furrows. The smooth and stout twigs of the White Ash, which are flattened at their nodes and arranged opposite each other, are also helpful means of identification.

During summer the White Ash may be identified by its smooth opposite, compound leaves, with five to nine even stalked leaflets. In winter its blunt-pointed brown buds, arranged opposite each other on the smooth twigs, are distinctive.

The fruit ripens about September, but often hangs in clusters far into the winter. The individual seed resembles a grain of oats. At one end it tapers to a point, and is attached to the twigs by a thread-like stem; at the opposite end a narrow wing about twice the length of the seed is fastened. These wings assist the wind in scattering the seeds, and thus help nature in propagating the tree.

The wood is hard, strong, straight-grained and tough. It is an all-purpose wood, weighing 41 pounds per cubic foot, and used extensively for many essential purposes.

BLACK ASH

FRAXINUS NIGRA *Marshall*

FAMILY.—Olive.

OTHER NAMES.—Hoop Ash; Swamp Ash; Basket Ash; Brown Ash.

GENERAL DESCRIPTION.—*Shape:* slender, short trunk bearing narrow and shallow crown. *Height:* 60 to 80, sometimes 100 feet. *Bark:* thin, grayish, scaly, somewhat corky. *Buds:* terminal buds ovate, sharp-pointed, black; lateral buds almost as broad as long, blunt-pointed, black, closely appressed to twigs *Leaves:* opposite, compound, about 14 inches long, with 7 to 11 sessile leaflets. *Flowers:* appear about May before the leaves; occur in dense clusters or open panicles. *Fruit:* a winged seed (samara) 1 to 2 inches long and grouped in drooping clusters about 7 inches long.

PREFERRED HABITAT.—Cool, swampy situations.

RANGE.—Newfoundland to Manitoba; south to Delaware, Virginia, and Arkansas.

THE Black Ash is loaded down with a long list of common names. It is called Hoop Ash because it was used in pioneer days in the manufacture

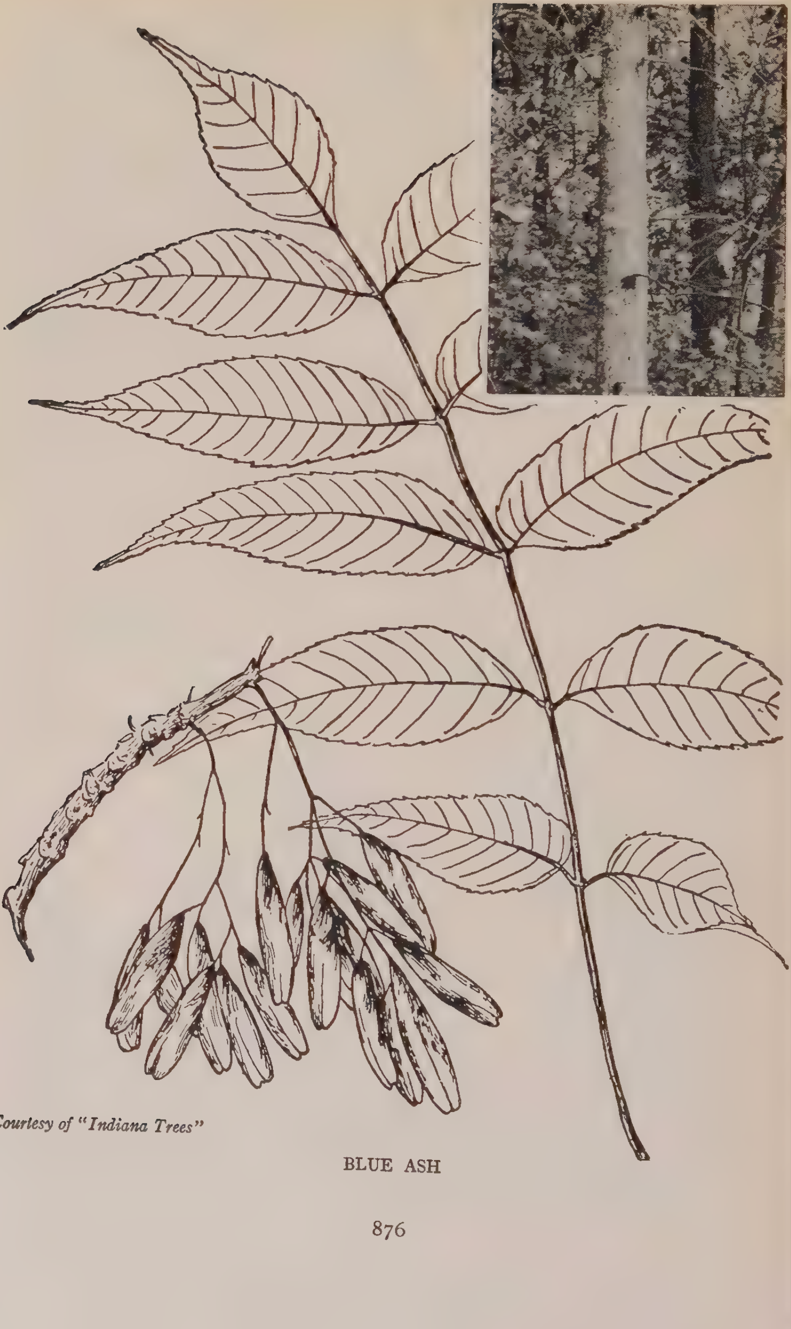


Photo by U. S. Forest Service

Courtesy of "Indiana Trees"

BLUE ASH

of barrel hoops. The name Basket Ash was given to it because the Indians preferred it to all other kinds of wood in making baskets. The name Swamp Ash is very appropriate, for it is essentially a tree of swamps and flourishes best in the cooler sections of the country.

The Black Ash is recognized easily at any season of the year. In summer its opposite and compound leaves with 7 to 11 *stalkless* leaflets is a sure means of identification, for all other native Ash trees have leaflets with stalks. In winter it can be identified by its black, ovate and sharp-pointed buds. In autumn its seed with flat kernels and wings extending to the base of the seed are also distinctive. In addition to these seasonal features it may be recognized at all periods of the year by its slender form, clean trunk, shallow crown, and thin grayish bark which is soft and corky and not furrowed like that of the White Ash. On many trunks the bark is so soft and corky that it crumbles and becomes mealy if rubbed.

This tree is not recommendable for ornamental planting, for it does not thrive on dry situations, and like all other Ashes it leafs-out late in spring and sheds its foliage early in autumn.

BLUE ASH

FRAXINUS QUADRANGULATA *Michaux*

FAMILY.—Olive.

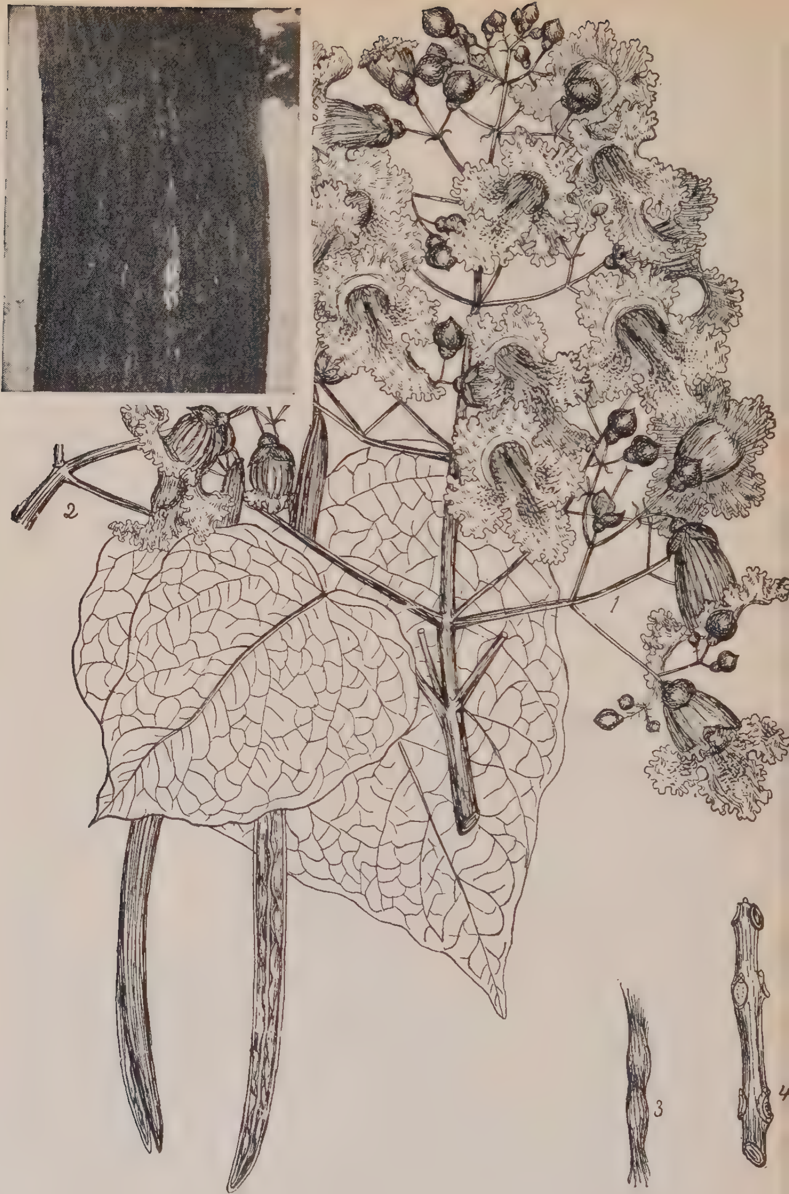
GENERAL DESCRIPTION.—*Shape:* short trunk with slender crown of spreading branches. *Height:* 75 to 100, sometimes 115 feet. *Bark:* on old trunks light gray, separating in large plates usually curling up at sides; on branches light brown to ashy gray. *Buds:* opposite, dark reddish-brown, with 3 pairs of scales; terminal bud ¼ of an inch long, laterals shorter. *Leaves:* opposite, 8 to 12 inches long, compound with 7 to 11 leaflets; leaf-stalks more or less hairy. *Flowers:* appear before leaves in April or May, occur in small clusters along twigs. *Fruit:* a winged seed (samara) 1 to 2 inches long, about ½ of an inch wide, grouped in dense drooping clusters.

PREFERRED HABITAT.—Fertile limestone hills and rich lowlands.

RANGE.—Southern Ontario and Minnesota south to Tennessee, Alabama, and Arkansas.

THE Blue Ash is perhaps the easiest to identify of all the ashes native to the United States. It can be recognized at any season of the year by its four-angled twigs, which have four distinct ridges running lengthwise along the bark. This characteristic is not found in any other native Ash, and disappears as the branches become larger.

It has other specific characteristics that help one recognize it. In summer its inner bark, if mixed with water, shows a blue coloring. This blue coloring was formerly used as a dye and gave the tree the name "Blue Ash." In autumn and early winter its short, broad and winged



CATALPA

1 = A panicle of flowers; 2 = a branch with two drooping cigar-like fruits, the one split open showing the seeds; 3 = a winged seed; 4 = a winter twig

seeds, and in spring its small clusters of flowering occurring along the twigs; are helpful in recognizing it.

The Blue Ash is chiefly a native of the Mississippi Valley, where it grows commonly on uplands, such as fertile limestone hills, and reaches a height of more than 100 feet. It is an excellent tree for street and park planting.

THE BIGNONIA FAMILY

BIGNONIACEÆ

THE Bignonia Family is one of the largest with tree representatives in North America. It comprises 100 different groups of plants, with a total membership of over 1,500 different trees, shrubs, woody climbers, and a few herbs. Most of its representatives occur in the tropics, only a few being native to the United States.

The Catalpas are the most prominent members of this family in our flora. There are seven species of Catalpa in the world, and two of them—the Eastern Catalpa and the Western Catalpa—are among our native trees. Both produce attractive foliage, beautiful flowers, unique fruit, and yield decidedly durable wood.

CATALPA

CATALPA BIGNONOIDES *Walter*

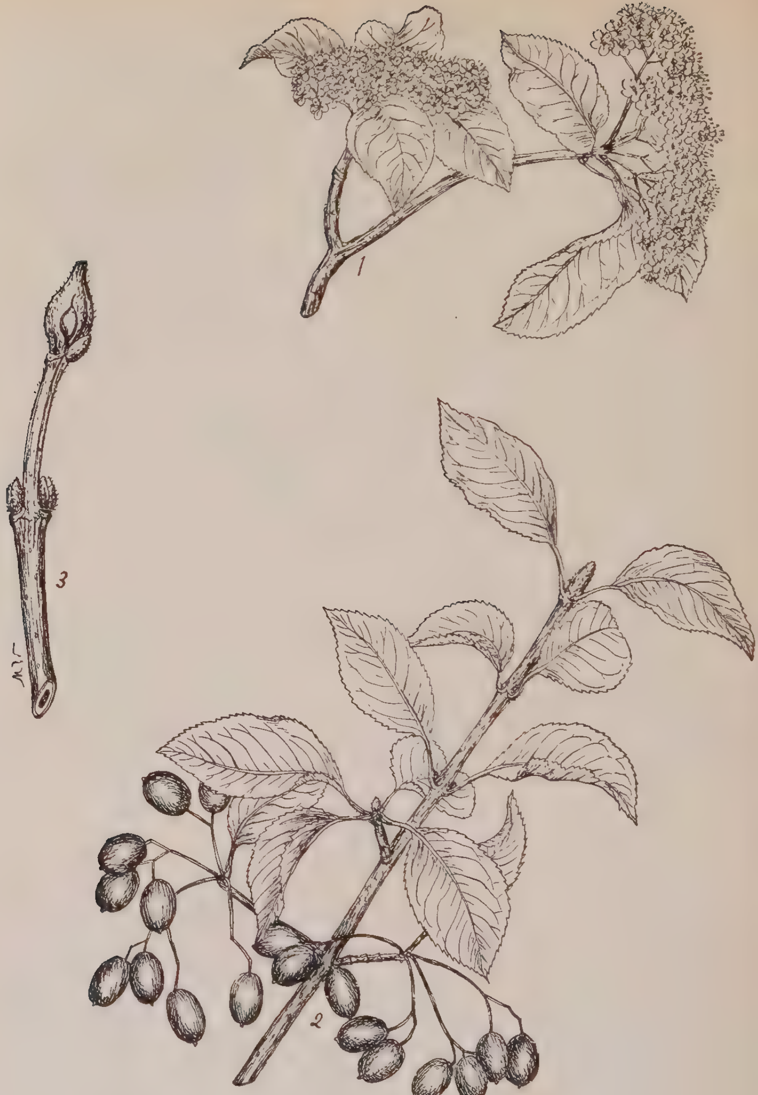
FAMILY.—Bignonia.

OTHER NAMES.—Eastern Catalpa; Indian Bean; Bean Tree; Cigar Tree; Indian Cigar Tree.

GENERAL DESCRIPTION.—*Shape:* broad, spreading and rather symmetrical. *Height:* 25 to 40, sometimes 60 feet. *Bark:* light-brown, bitter, rather thin, scaly. *Buds:* small, almost imbedded in bark of twigs. *Leaves:* large, opposite or whorled, simple, 6 to 10 inches long, 4 to 5 inches broad, entire or wavy on margin. *Leaf-scars:* large, elliptical in outline, with projecting margins; bundle-scars arranged in ellipse. *Flowers:* appear in June and July in large many-flowered panicles. *Fruit:* bean-like or cigar-like capsule containing many winged seeds.

PREFERRED HABITAT.—Moist, fertile situations. Endures shaded conditions, and will grow on dry sites.

RANGE.—Original range within Georgia, Alabama, Mississippi, and Florida. Now found in all States east of Rocky Mountains, and as far north as New England.



BLACK HAW

1 = A branchlet with leaves and two cymes of flowers; 2 = a branchlet with leaves and two clusters of **fruits**; 3 = a winter twig with a large terminal flower-bud and three leaf-buds. Two leaf-buds are opposite, and located about the middle of the twig, while the third is at the base and to right of the terminal flower bud, natural size

By their flowers and fruits you may know the Catalpas. Next to the Horse-chestnut, the Catalpa bears the most showy flowers of any of our native or commonly introduced trees. When in blossoms, the trees are covered completely with panicles of flowers, which are often so numerous and so closely set that it is difficult to see the foliage behind them.

The fruit, which often persists far into winter, is an elongated capsule containing many small winged seeds. It resembles a long round bean or elongated cigar, whence its common names, Bean Tree and Cigar Tree.

In winter it may also be distinguished by its small buds, almost imbedded in the bark, and its large elliptic leaf-scars, which are opposite or whorled and contain an elliptic ring of bundle-scars. In summer the large ovate leaves are very distinctive. The common Eastern Catalpa closely resembles the Western Catalpa (*Catalpa speciosa* Warder), native to the middle western States. The former can be distinguished by its slenderer and thinner-walled fruit, larger flower clusters, more conspicuous markings on the inner surface of the corolla of each flower, and more blunt-pointed leaves. The western species suffers less from frost and produces straighter trunks than the eastern species.

THE VIBURNUM FAMILY

CAPRIFOLIACEÆ

Black Haw

Viburnum prunifolium *Linnæus*

Family.—Honeysuckle.

Other Names.—Sweet Haw; Sheepberry; Stag-bush; Nannyberry.

General Description.—*Shape:* trunk short, often crooked, bearing a broad, round-topped crown. *Height:* 15 to 20, sometimes 35 feet, with a diameter of 10 to 12 inches. *Bark:* rough, reddish-brown, broken into thick plate-like scales. *Buds:* opposite, ¼ to ½ of an inch long, covered with rusty pubescent scales. Lateral buds flat and hug twig; flower buds swollen near base. *Leaves:* simple, oval, 1 to 3 inches long, finely serrate on margin, and leathery when old. *Flowers:* small, white, appear about May in dense, many-flowered stalkless cymes from 3 to 4 inches wide. *Fruit:* fleshy, sweet, and juicy, dark-blue drupe, grouped in reddish stalked clusters.

Preferred Habitat.—Dry, rocky hillsides. Common along fences and roadsides, and occasional in moist locations.

Range.—Connecticut south to Georgia and west to Arkansas.

There are about one hundred different kinds of Viburnum in the world. Black Haw is one of them. Some of the other common kinds of Viburnum are the Sweet Viburnum, Maple-leaved Viburnum, and Hobble-Bush. They all belong to the Honeysuckle Family, of which the common Elderberry is also a member.

The Black Haw is a small tree, usually 10 to 15 feet high but occasionally reaches a height of 35 feet Its leaves are about 2½ inches long, blunt-pointed, and finely-toothed on their margin. The best distinguishing characteristic of the Black Haw, present at all seasons of the year, is its stiff lateral branchlets, which stand out almost at right-angles to the main branches and the stem.

Its buds are also a helpful means of identification. They are arranged opposite each other, and are from ¼ to ½ of an inch long, and covered with two rusty, hairy scales. The lateral buds are about ¼ of an inch long, decidedly flattened, and hug the twigs closely. The flower buds are enlarged near the base.

The flowers are also a helpful means of identifying the Black Haw. They are small in size, white in color, and arranged in flat-topped clusters which are from 3 to 4 inches broad. It is not unusual to find small trees which are completely enveloped with white flowers during early May.

BLUE GUM

EUCALYPTUS GLOBULUS *Labill*

FAMILY.—Eucalyptus.

GENERAL DESCRIPTION.—*Shape:* trees about 200 feet or less. *Bark:* grayish or bluish-white, smooth, except at base. *Leaves:* lanceolate, thick; calyx-tube and lid covered with bluish-white wax. *Flowers:* large, angular; attractive to bees.

PREFERRED HABITAT.—California; extensively planted.

RANGE.—South; stands long drought without irrigation, in a region of only 8 or 10 inches annual rainfall.

ALL the Eucalyptus Family are natives of Australia. The genus contains upward of one hundred and forty species, but the one common to California is the Eucalyptus Globulus (blue gum).

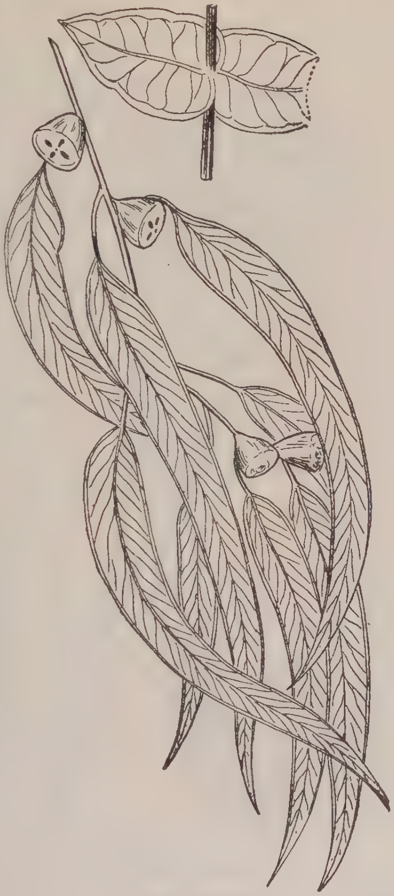
While the Eucalyptus is not a native American tree, it has been grown so extensively in California and our island possessions that it deserves a brief mention here, for it has long since passed out of the speciality class and may now be found by the millions all over certain sections.

It is a very rapid-growing tree, often reaching two hundred feet in height and three feet in diameter at the base. The bark is grayish or blue white, smooth except in old trees at the base of the trunk, and sheds its bark in long ribbon-like strips almost continuously. The leaves are lanceolate and thick, hanging downward for the most part on slender branches, giving the tree the appearance of being covered with great bunches of feathers.

The young leaves yield eucalyptus oil, extensively used for medicinal purposes. The bark yields a resin containing tannin in commercial quantities, and on account of this fact it is classed with the gum trees. It is being planted widely in malarial regions, and is proving very beneficial in that connection.

Its calyx is tube-like, lid covered with a bluish-white wax. The flowers are attractive to bees, but the nectar has a strong and unpleasant odor. It spreads rapidly by volunteer seedlings, and will stand protracted drought without irrigation.

In Australia, its timber is very widely used by ship-builders for planking and keels, also for fence rails, telegraph poles, and railroad ties, but in America it is used almost exclusively for decorative purposes, local wood supply, and wind-breaks. It is said that one-tenth of an acre of ten- to twelve-year-old trees will supply one family continuously with wood supply, for it will stand very severe pruning, and if cut at the end of the dry season when the sap is least active it may be cut completely off only to sprout vigorously again from the stump.

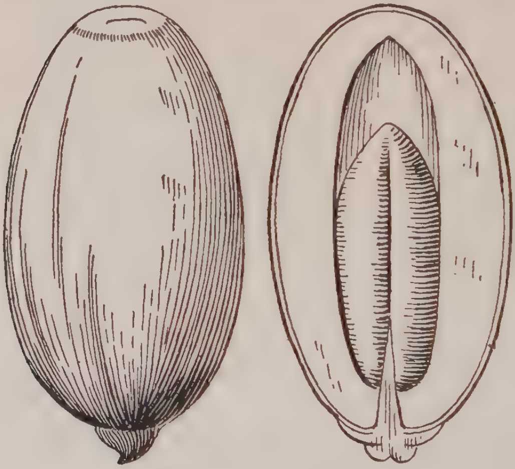

EUCALYPTUS

AMERICAN PALMS

PALMÆ (*Sargent*)

DATE PALM (*Phœnix dactylifera*).
COCOANUT PALM (*Cocus nucifera*).
PALMETTO PALM (*Labal palmetto*).
FAMILY.—Palm.
GENERAL DESCRIPTION.—*Shape:* trees growing by a simple terminal bud, with stems covered by a thick rind; occasionally stemless. *Leaves:* at top of stem, plaited in bud, fan-shaped or pinnate. *Flowers:* perfect or unisexual.. *Fruit:* a drupe or berry.
PREFERRED HABITAT.—Florida.
RANGE.—California, Arizona, Texas, and Florida.

THE word Palm is a popular designation of one of the largest and most important families among the monocotyledons. There are upward of 1200 species of palms. They are essentially tropical in habitat, are highly ornamental, and many of them have a very great economic value. Their fruits, stems, and leaves are used in the extensive manufacture of more than 800 articles.


FRUIT OF DATE PALM

In America there are three common palms, many varieties of each of these being known. They are the DATE PALM, the COCOANUT PALM, and the PALMETTO PALM. They may be found through California, Arizona, southern Texas, and around the Gulf into Florida.

One of the notable characteristics of palms in general is their unbranching stems, the exceptions to this rule being very few. While these unbranched stems form a prominent feature in connection with this order of plants, yet great variations are found in size and habit, some members of the family towering up like slender marble shafts to a height of more than one hundred feet, and then terminating in a crown of magnificent

PALMETTO PALM

plume-like leaves, while others may be but three or four feet in height when fully developed, and show little or no trunk.

Hardiness in palms is a matter of size: smaller ones do not winter well while larger ones will winter readily. However, severe sun is as hard on the young plants as is frost. They are largely used for ornamentation and wind-breaks, and have no value whatever for wood, as the trunk is generally a fibrous, pithy growth that is very open and porous.

The foliage of the palms is of two chief kinds—the fan-veined leaves, in which the venation radiates from a common center, and the feather-veined, in which the veins run out from the sides of a long mid-rib, the leaf being frequently divided into long, narrow segments. Of the first group, the common Fan Palm, is an example, while the Date Palm and Cocoanut Palm are common examples of the feather-veined class.

The flowers in general are not especially attractive on any of the palms, either in size or color. Many of them are greenish-white or yellow, some orange and red. The interesting thing about them is the enormous quantities in which they are born, sometimes running up to the surprising number of a million or more.

The seeds of the palms also vary greatly as to size and shape, running from a pea-like seed to a cocoanut.

If interested in differentiating between the many genera and species of palms, a complete work on the subject should be consulted for general purposes. However, a knowledge of the three referred to will serve all practical purposes.

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